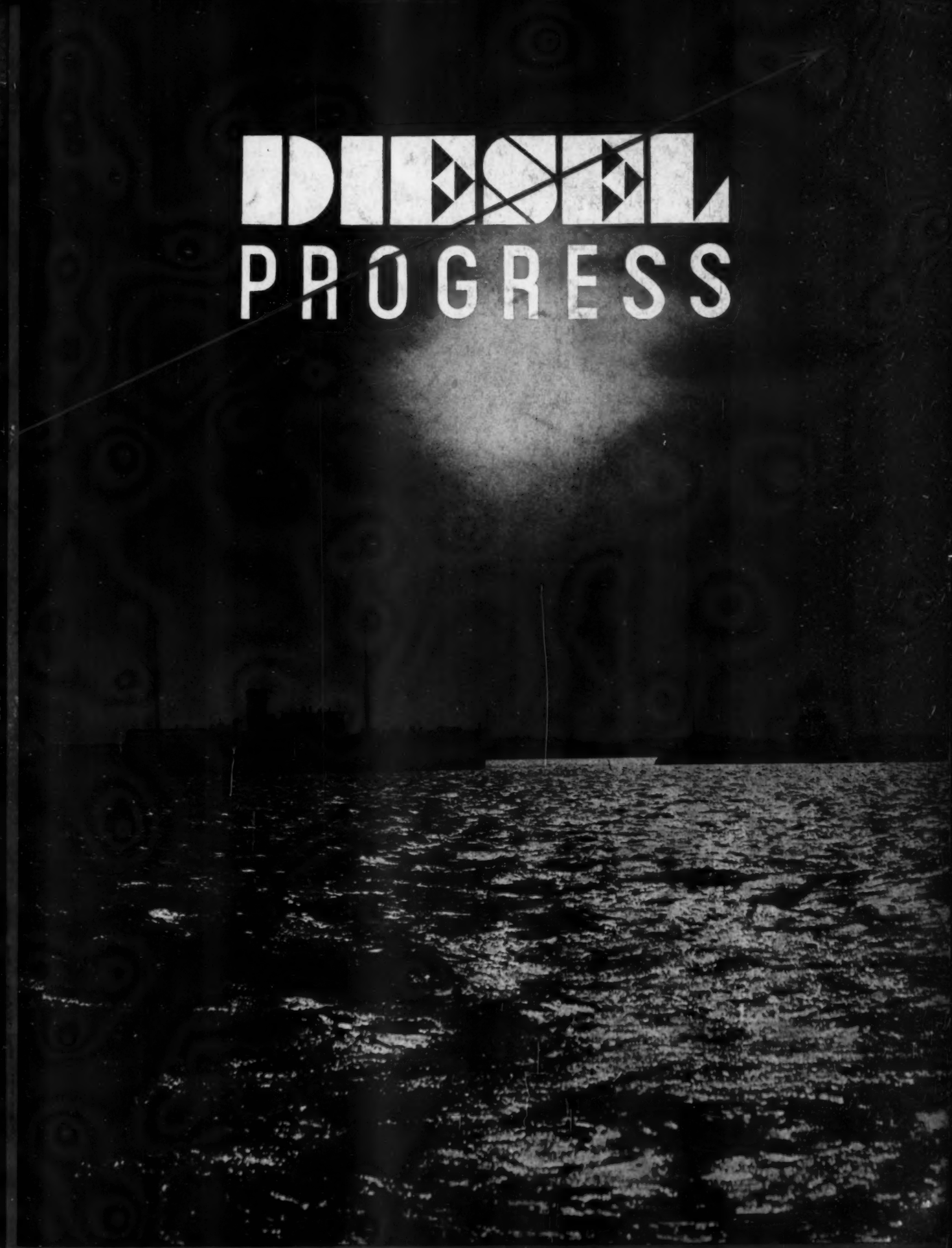
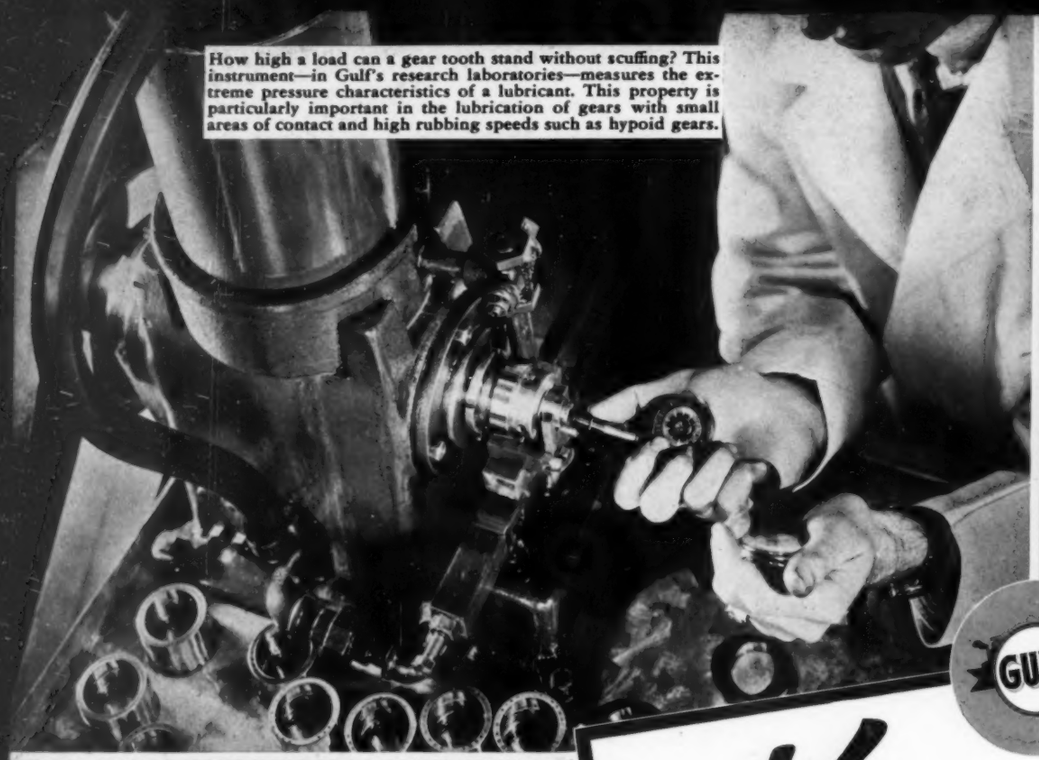
DIESEL PROGRESS

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR



NOVEMBER, 1936 CIRCULATION OF THIS ISSUE—IN EXCESS OF 11,000 COPIES 25c



How high a load can a gear tooth stand without scuffing? This instrument—in Gulf's research laboratories—measures the extreme pressure characteristics of a lubricant. This property is particularly important in the lubrication of gears with small areas of contact and high rubbing speeds such as hypoid gears.

Many new bearing metals have been developed during recent years. Here the Underwood test is used to determine the effects of oils on various bearing metals.

GULF INDUSTRIAL LUBRICATION

Know WHAT'S BEHIND QUALITY CLAIMS WHEN YOU BUY DIESEL LUBRICANTS

GULF OIL CORPORATION
GULF REFINING COMPANY
GENERAL OFFICES: GULF BUILDING

This complicated apparatus—in Gulf's laboratories—is used to study the behavior of oils at high temperatures in the presence of oxygen. Some oils deteriorate more rapidly than others under these conditions, forming organic acids, insoluble sludges, and soluble impurities of high viscosity. Samples of the oil are withdrawn at frequent intervals for test, and changes measured. Gulf supplies oils with highest resistance to such deterioration.

Lubricating oils contain many types of hydrocarbon molecules. Gulf scientists classify hydrocarbons with respect to their influence on the stability of the oil—another step to insure the high service value of Gulf quality lubricants.

The "Chemist's Aquarium." This adiabatic thermostat measures extremely small temperature changes due to chemical reaction in an oil. The data secured are valuable in certain fundamental studies.

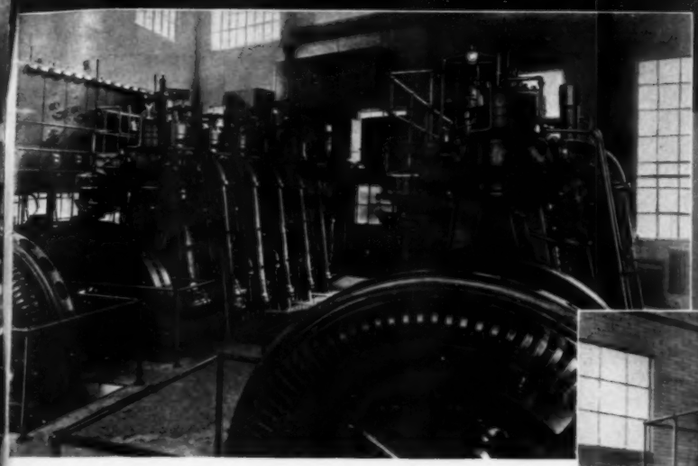
Oxygen is one of oil's greatest enemies. This apparatus is measuring the rate at which oxygen combines with an oil and the effect of catalysts and anti-catalysts. This equipment was developed by Gulf.

A new machine developed by Gulf engineers—the first that will test any bearing under precisely the operating conditions of actual service. It measures accurately friction, torque, temperature, wear and film thickness. Thus, Gulf research engineers develop new information which is useful in the manufacture of improved bearing lubricants.

DIESEL PROGRESS for November, 1936. Volume II, No. 11. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 2 West Forty-fifth Street, New York, N. Y. Rex W. Wadman, President. Acceptance under the Act of June 5, 1934, at Brooklyn, New York, authorized May 14, 1935. Subscription rates: United States and Pan American countries $3.00, Canada and all other countries $5.00 per year. Single copy price 25 cents in U.S.A., 30 cents for all other countries.

Fifteen Years In Municipal Service and still going strong

Long Life Faithful Service Economical Operation



Above—Two 550 hp. Nordberg Diesel engines installed in the municipal power plant at Marshall, Michigan, in 1921 are still in regular service.

Right—A third Nordberg unit of 1250 hp. that has just been placed in operation.

WHAT is the life of a Diesel engine? This frequently raised question can only be answered by the quality of the design, how well the engine has been built and the reputation of the builder.

The service given by the two 550 hp. engines in the Marshall, Michigan, municipal plant is typical of that given by many similar installations of Nordberg Diesels. While these two fifteen-year old engines are still capable of years of economical operation, they no longer have sufficient capacity to carry the present load. Another and larger unit had to be installed and following the usual custom of so many Nordberg owners, another Nordberg unit was chosen. Continuing to buy Nordberg Diesels on the basis of past experience is evidence of their faithful performance and their long, economical life.

NORDBERG MANUFACTURING CO.
MILWAUKEE, WISCONSIN

NEW YORK 60 East 42nd St.	WASHINGTON 917 Barr Bldg.	CLEVELAND Rockefeller Bldg.
LOS ANGELES Subway Term. Bldg.	DALLAS 3801 Potomac Ave.	KANSAS CITY 2 West 62nd St.

NORDBERG
• DIESEL ENGINES •

By this RECORD

NO TROUBLE FROM DEPOSITS In an Eastern power plant Gargoyle D.T.E. Oils have been used on four large Diesels since their installation. Cylinder wear has been remarkably low. This excellent lubrication result has been accompanied by freedom from trouble with deposits. Periodic inspection always finds rings free in their grooves. The bearing oil in one of these engines is still in excellent condition after eight years' service. It was of course necessary to add a reasonable amount of "make-up" during this period.

NO NEW PISTON RINGS IN 2 YEARS A municipal utility in Kansas using Gargoyle D.T.E. Oils found that after two years of operation the greatest wear in the cylinders of their Diesel did not exceed 14 thousandths of an inch. No new rings have been installed.

PE
A
Die
dep
ins
fec
mi

.00
An
Ga
a 30
to .

GARGOYLE
Lubricants

S

STAN
WAD

In every field of service we can show you Diesel engines lubricated by Gargoyle D.T.E. Oils with records proving economical performance.

JUDGE *Your Own* DIESEL OIL!

PERFECT CONDITION AFTER 3 YEARS OF OPERATION
A Michigan plant changed to Gargoyle D.T.E. Oils on two 550 h.p. Diesel engines. After the change these engines gave continuous dependable operation. When one of the engines was dismantled for inspection after three years, cylinders were found clean and in perfect condition. Two years later another inspection showed no gumming or sticking of piston rings.

.0015" CYLINDER WEAR PER 1000 ENGINE HOURS
An Iowa power plant obtained many worth-while economies with Gargoyle D.T.E. Oils. After 38,721 hours of operation the total wear in a 300 h.p. engine (average of 3 cylinders at top of ring travel) amounted to .0583", which is equivalent to .0015" per 1000 hours of operation.

NO ADJUSTMENTS AFTER 8 YEARS Gargoyle D.T.E. Oils have been used on a Diesel engine in a Kansas power plant since the original installation. After total operation of 40,514 engine hours the unit received a complete mechanical inspection. No shims were removed nor any adjustments made to the engine bearings.

LUBRICATION COST $.686 PER 1000 KW.-HOURS
A large Michigan utility changed to Gargoyle D.T.E. Oils on their two large Diesel engines and on their air compressor. The cost figures on Gargoyle Lubricants were $.686 per 1000 kw.-hours compared to a cost of $2.33 per 1000 kw.-hours when competitive oils were in service. Based on an annual output of 1,080,000 kw.-hours this amounts to an annual saving of $1,775.52.

You'll find thousands of units have proved Gargoyle D.T.E. Oils are unsurpassed in economical performance

YOU SELECTED THE DIESEL OIL you are now using because you believed it the most economical. If you did not decide on Gargoyle D.T.E. Oil, we feel, frankly, it was only because all the facts were not before you.

Read the above six examples of Gargoyle D.T.E. Oils' economy. They are typical of a record that goes back to 1901 when the makers of Gargoyle Lubricants worked with Dr. Diesel . . . developed a new oil now accepted as the standard of excellence.

We do not attempt to solve your individual problem by presenting all the buying reasons to you in this advertisement. The development of the present Gargoyle D.T.E. Oils is a story of exacting selection of crudes, painstaking laboratory work, careful refining, proper application to specific operating requirements and thorough checking of results in the field.

The Socony-Vacuum man who calls on you can present this in detail. He'll show you how each factor can influence greater economy for your Diesels. *He can prove it to you by results on installations similar to your own.*

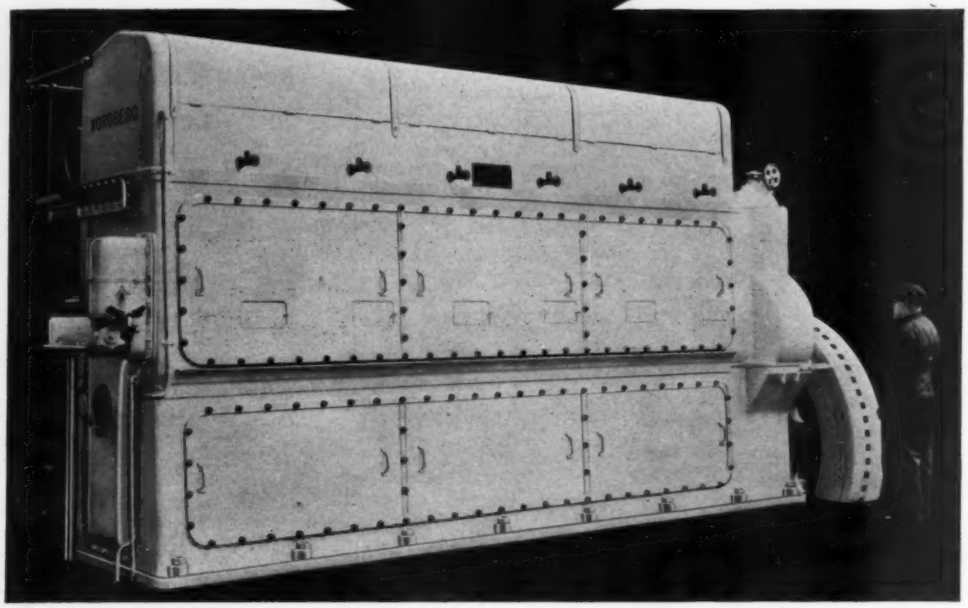
SOCONY-VACUUM OIL CO.

INCORPORATED

STANDARD OIL OF NEW YORK DIVISION · WHITE STAR DIVISION · LUBRITE DIVISION · WHITE EAGLE DIVISION
WADHAMS OIL COMPANY · MAGNOLIA PETROLEUM COMPANY · GENERAL PETROLEUM CORPORATION OF CALIFORNIA

CRANKSHAFTS

Erie crankshafts selected by Nordberg Manufacturing Company for two four cycle Diesel Engines (one 500 h.p. and one 750 h.p.) installed in Cotton Oil Mill in the Southwest.

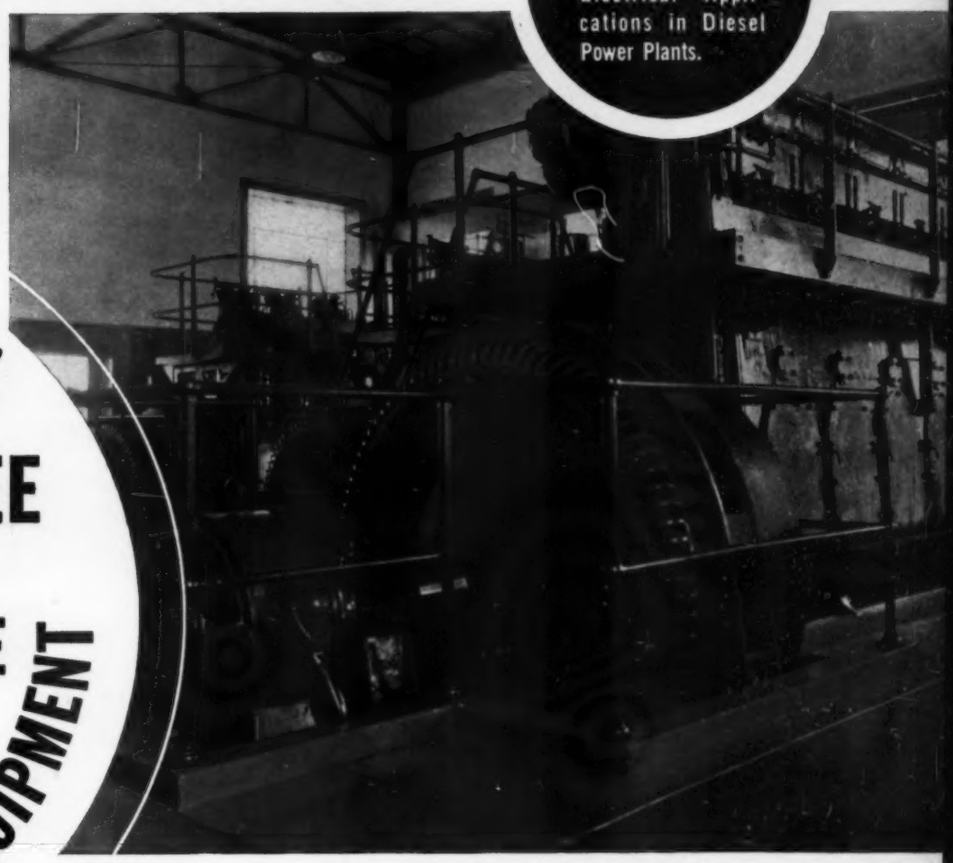


Leading builders of Diesel engines rely upon Erie crankshafts, connecting rods, crossheads, generator and extension shafts when fine quality and accurate finish are necessary.

Complete facilities for prompt delivery on all major forged or cast steel elements required in the building and powering of every type of installation.

ERIE FORGE COMPANY, *ERIE • PENNSYLVANIA*

No. 4 of a series showing the scope of Westinghouse Electrical Applications in Diesel Power Plants.



Secure this 3 WAY GUARANTEE *with* WESTINGHOUSE COMPLETE ELECTRICAL EQUIPMENT

★

NEAR MATEHUALA, MEXICO—Power House of the Compania Minera Kildun y Anexas . . . WESTINGHOUSE ENGINE GENERATORS, driven by INGERSOLL-RAND DIESELS.

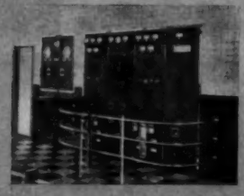
Guarantee LIFETIME SATISFACTION

There is no safer way to guarantee lifetime satisfaction from your Diesel power plant than by specifying Westinghouse complete electrical equipment.

ES GENERATORS—Especially designed for lifetime operation in Diesel Service, with these extra values: *Solid Steel Rotor*, to withstand severest stresses under all conditions. *Protection against Shut-downs*, insured by exclusive high frequency pre-testing. *Positive Ventilation*, for cool running and long life.

EXCITERS—Either direct-connected or belt-driven, as required.

MOTORS—With dual-protected windings, rigid cast frames, and sealed-sleeve bearings . . . for driving compressors and other auxiliaries.



COMPLETE SWITCHBOARD ACCESSORIES—For every requirement: instruments, instrument transformers, switchgear, circuit breakers, relays.

To those who contemplate the installation of Diesel-electric power systems, Westinghouse makes this suggestion—secure this 3-Way Guarantee:

(1) *The guarantee of undivided responsibility.* Westinghouse is qualified, willing and able to provide complete electrical equipment for Diesel-power plants, thus facilitating negotiations and concentrating responsibility for the electrical installation in one dependable source.

(2) *The guarantee of matched performance.* Westinghouse experience goes back to the first engine generators produced in this country. It includes applications especially designed for Diesel power units, such as generators, exciters, motors and switchboard accessories—all co-ordinated in design to give matched performance—and all designed in turn to match the requirements of Diesel engine drives.

(3) *The guarantee of service.* With nationwide service facilities, concentrated in 37 Westinghouse service shops manned by factory-trained experts, Westinghouse is in a position to guarantee prompt and efficient service on a day's notice or less.

Secure these benefits, specify *complete Westinghouse electrical equipment.*

J 10014

WESTINGHOUSE 1886 W 1936 GOLDEN JUBILEE

Westinghouse

ENGINE-DRIVEN GENERATORS AND ELECTRICAL AUXILIARIES

RED HEAD
4 DM 186
WATER NYMPH
Two 6 DM 415
010
Two
6 LDM 468
NORCONIAN
6 DM 415
SEMLOH
Three 6 LDM 909
HARWELL
Two
6 LDM 909
ELLEN BEE
Two
6 DMB 415
THE LOG OF BUDA ENGINES
Alsumar — Dave H. Morris, Jr., New York City
Ahree, II — R. E. Jones, Santa Barbara, Calif.
Aquaris II — A. S. Kratz, Richmond, Virginia
A U — H. D. Sloggat, Hawaii
Bazo — Capt. Jesse Conyne, Miami, Fla.
Bimese — Fred S. Ford, Detroit, Michigan
Bonnie Dundee — Clifford D. Mallory, Indian Harbor, N. Y.
Conte Picolle — Conte Guiseppe Cippico, Italy
Dorbette II — F. K. Brun, New York
Dragoon — Stanley H. Barrown, San Francisco
Ellen Bee — Thomas F. Griffin, Coronado, Calif.
Floralina — A. T. Heath, Fort Meyers, Fla.
Amaryllis — A. T. Heath, Trinidad, B.W.I.
Dar Deval — C. T. Watts, Trinidad, B.W.I.
Olala — Roumanian Minister to Istanbul, Turkey
Gladys L — French Consul at Istanbul, Turkey
Harwell — Leroy French, New York
Arthur W. Holder, Annapolis, Md.
Judy — John F. Walsh, Miami, Fla.
Libra — Graham Thompson, Greenwich, Conn.
Manuda — Henry B. Babson, Chicago
Margaret — J. P. Cook, New York
Madray II — Raymond Geist, Chicago
Norconian — Capt. Wm. S. Clark, Santa Barbara, Calif.
010 — John Waterhouse, Honolulu
Paunette — Paul W. Jones, Chicago
Red Head — John Wilkin II, New York
Semloh — Adrien Iselin II, Port Washington, L. I.
Water Nymph — Joy Holmes, Port Washington, L. I.
Diana — L. H. Heinke, Chicago
Winsome Too — Langhorne Gibson
Morning Star — Harnessa Edwards, East Hampton, L. I.
Libra II — Charles H. Thomas
Meander — G. C. Thomas
Day Dream II — Edward B. Merriman, Boston
Henry W. Anderson, Providence, R. I.
And many more

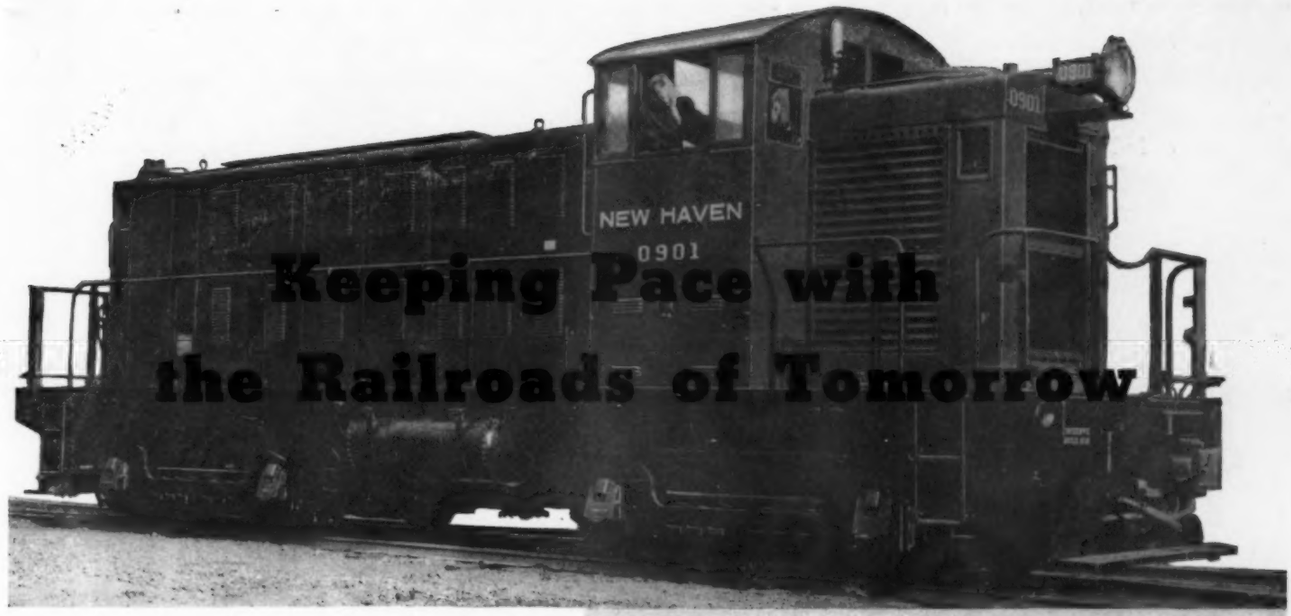
There Can Be No Better Testimonial to the Dependability of BUDA-LANOVA "Silver Crown" Diesel Engines Than Their Repeated Selection by Well Known Builders for Well Known Boats.

BUDA SILVER CROWN MARINE ENGINES

THE BUDA COMPANY
Marine Engine Division K
HARVEY { Chicago Suburb } ILLINOIS

Diesel Engines 32 to 180 HP.
Gasoline Engines 22 to 125 HP.
With or Without Reduction Gears

BUDA MARINE ENGINES



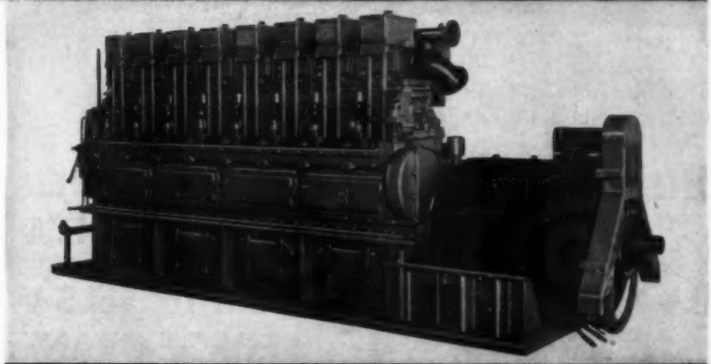
Keeping Pace with the Railroads of Tomorrow

THE New York, New Haven and Hartford Railroad has recently purchased ten one-hundred ton Diesel Electric Locomotives. These locomotives are equipped with the most modern type of Diesel engines built by two of America's leading Diesel engine builders.

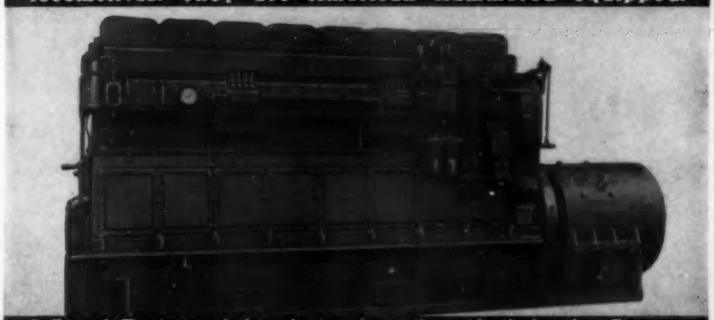
All ten Diesel engines are equipped with American Hammered Piston Rings.

KOPPERS COMPANY
AMERICAN HAMMERED PISTON RING DIVISION
BALTIMORE, MARYLAND

The modern railroads' super-heated steam locomotives use American Hammered's Cast Iron Bronze Sectional Piston Packing.



5 Diesel Engines of this type were built by Ingersoll-Rand Company, New York, N. Y., for New York, New Haven and Hartford locomotives. They are American Hammered equipped.



5 Diesel Engines of this design have been built by the Cooper-Bessemer Corporation, Mt. Vernon, Ohio, for New York, New Haven and Hartford locomotives They are American Hammered equipped.

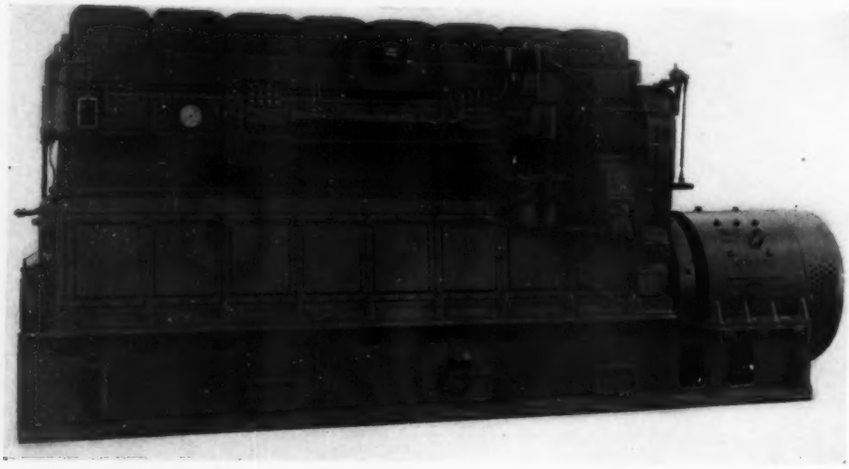
American Hammered Piston Rings

★ THE CHOICE OF THOSE TO WHOM TRANSPORTATION IS A BUSINESS ★

ONE OF THE FIVE COOPER-BESSEMER DIESEL-ELECTRIC LOCOMOTIVES FURNISHED TO THE NEW HAVEN RAILROAD

•

ALL FIVE COOPER-BESSEMER DIESELS WERE BUILT WITH ELLWOOD CITY FORGE CRANKSHAFTS



MANY years of successful power delivery through Ellwood City Forge crankshafts amply justify their selection by Cooper-Bessemer for the five 660 horsepower Diesel engines recently delivered to drive the New York, New Haven and Hartford Railroad Diesel-electric switching locomotives. The design, workmanship and materials embodied in these crankshafts are their own guarantees of satisfactory performance.

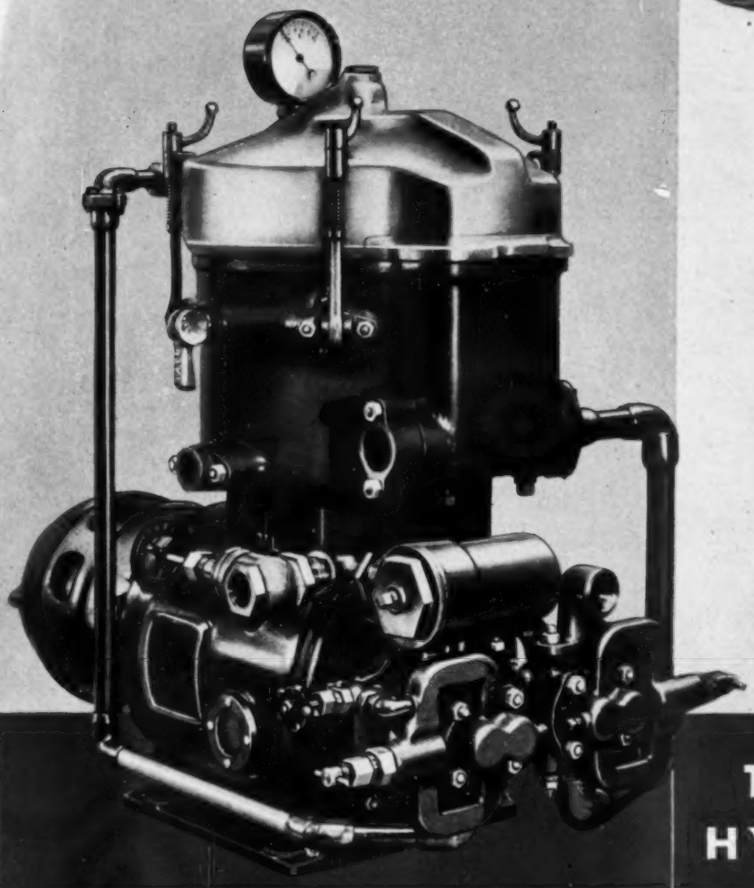
ELLWOOD CITY FORGE CO.

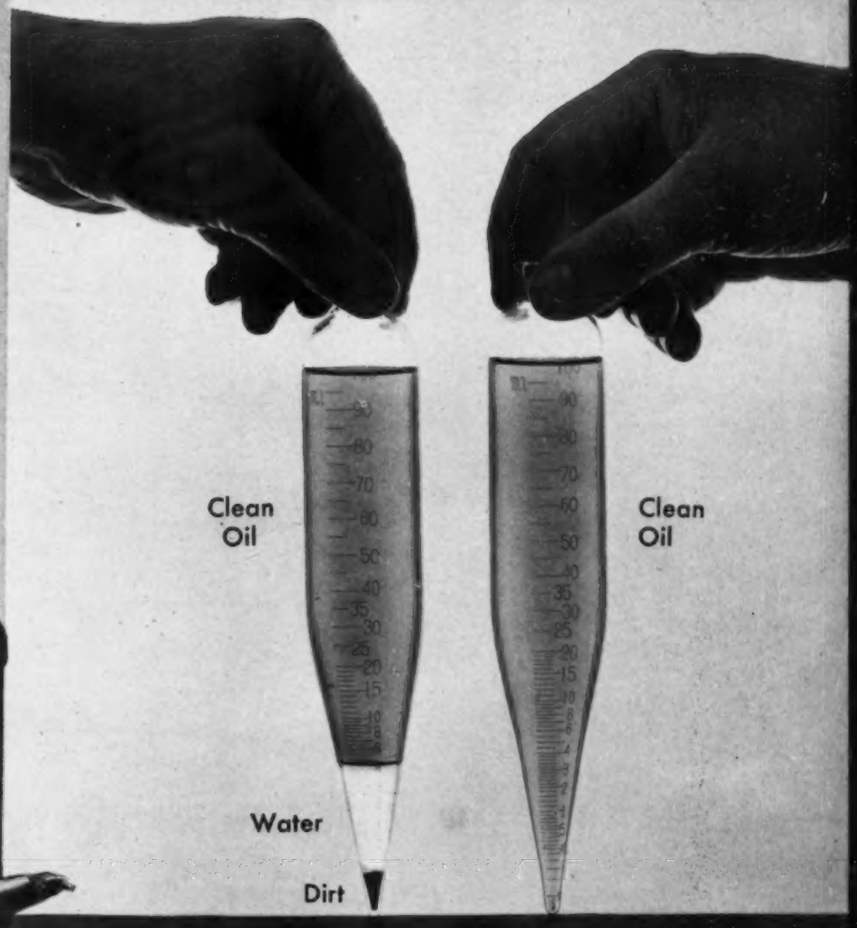
CRANKSHAFTS . . . CONNECTING RODS . . . MACHINE FORGINGS

ELLWOOD CITY, PENNA.

The only safe oil is clean oil

This unretouched photograph shows *"whizzed" samples of used oil before (left) and after (right) purification in a Goulds Hydroil Centrifugal Purifier.





THE *"WHIZZER" PROVES HYDROILIZED OIL IS CLEAN

I'm SLUDGE *the menace*

"I hate Hydroils. They go round and round until I get dizzy, then they throw me right out of the oil and I can't get back in again. I hate Hydroils."

Copyright 1936, Goulds Pumps Inc.

WHIRLING at high speed the *"whizzer" builds up a centrifugal force thousands of times greater than gravity—proves that oils, purified by a Goulds Hydroil Centrifugal Purifier, are brought back after use to the same clean, pure condition as originally furnished by the leading refiners. Hydroilized lubricating oils contain no grit, carbon or other abrasive materials that score bearings, shafts and compressors. Elimination of sludge and water does away with plugged oil lines and assures adequate lubrication at all times. Hydroilized fuel oil contains no dirt, sand or water that wears fuel pumps and nozzles—causes injection troubles.

In either continuous or batch operation a Goulds Hydroil maintains oil at the high efficiency necessary for non-stop Diesel operation and makes frequent oil changes or rest periods unnecessary.

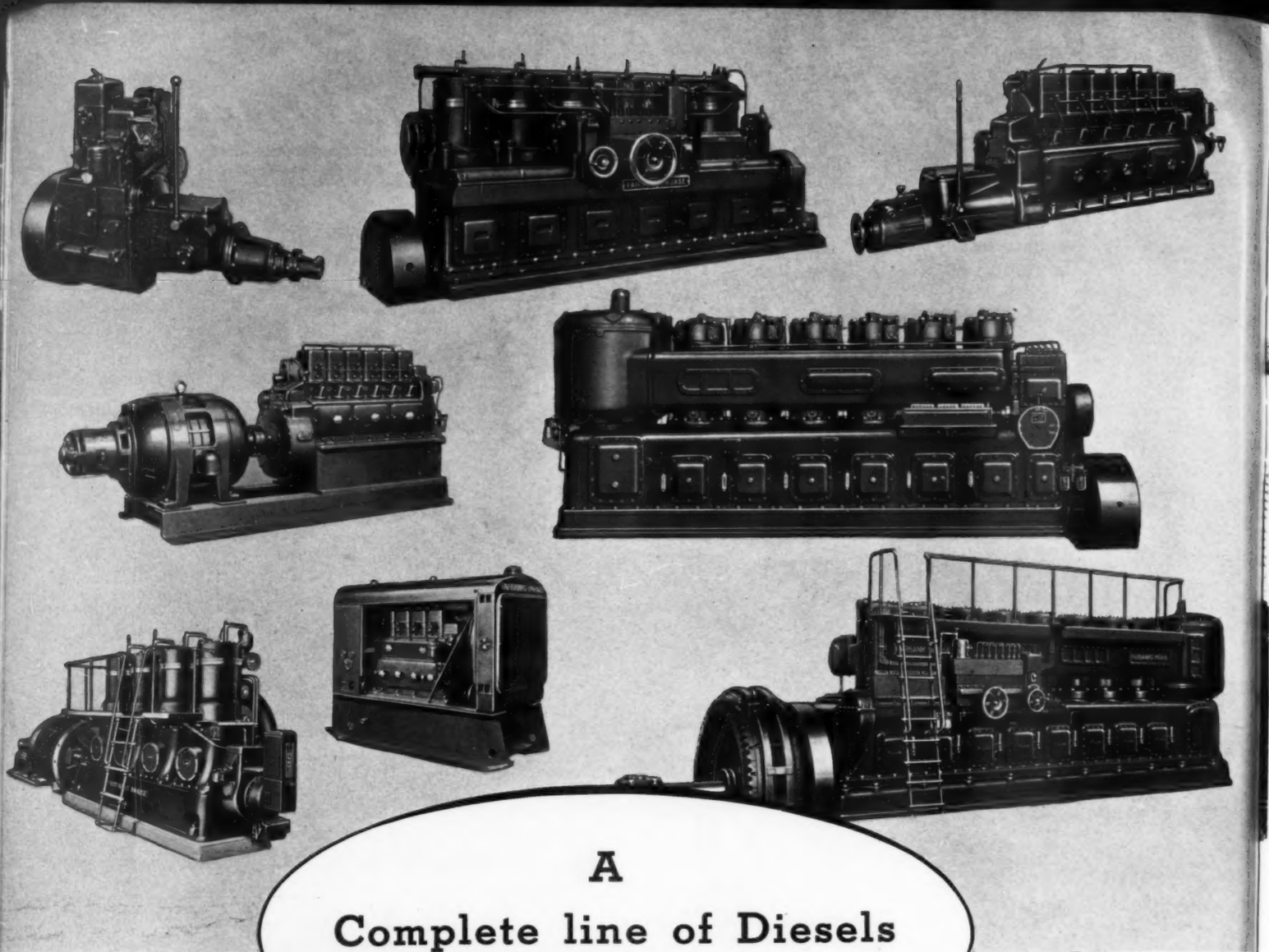
* Special High Speed Laboratory Centrifuge for testing oil samples, in which the test tubes revolve at 6600 R.P.M. on an 18-in. diameter circle producing a centrifugal force in excess of 11,000 times gravity—the modern and accepted method of testing oil samples for water and dirt content.

6061

GOULDS PUMPS Inc.

SENECA FALLS N. Y.

ATLANTA, BOSTON, CHICAGO, HOUSTON, NEW YORK, PHILADELPHIA, PITTSBURGH, TULSA, Representatives in all Principal Cities



A Complete line of Diesels to choose from!

A COMPLETE line of Diesels to choose from—a model for every application . . . what that means to the prospective user of Diesel power!

It means that he can discuss his particular power application with a Fairbanks-Morse engineer and know that the Diesel recommended is not one which will be adapted to fit a specific need, but one which was designed and built to do the job. Only a manufacturer with a complete line can offer such a service.

F-M stationary Diesels cover nearly every need of industry from compact, portable power units of 10 to 160 hp. up to giant, heavy duty Diesels to power a city. F-M Marine Diesels range from compact 10-hp. units for work-boat propulsion up to engines for the largest freighters. Auxiliaries supply current for battery charging and drive compressors and man the bilge pumps.

When you buy Diesel power, consider the extra advantages that only a manufacturer with a complete line has to offer. Then—call the man from Fairbanks-Morse. Or address Department N-81, Fairbanks, Morse & Co., 900 S. Wabash Avenue, Chicago, Ill. 34 branches at your service throughout the United States.

6832-OA40.108

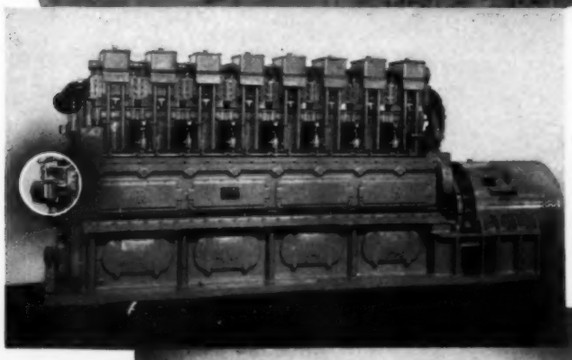
106 YEARS OF PRECISION MANUFACTURING

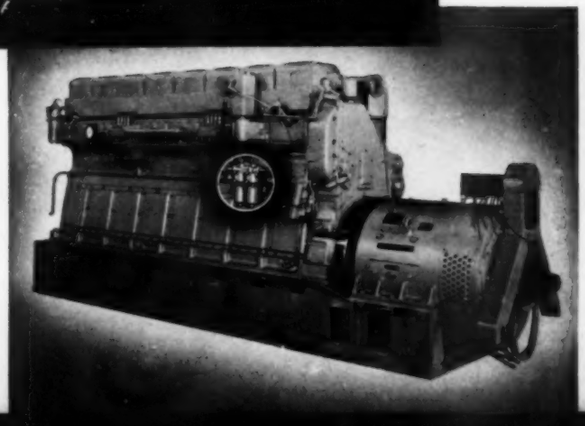
FAIRBANKS-MORSE

Diesel Engines

POWER, PUMPING AND WEIGHING EQUIPMENT

IN THE *Modern* MANNER





THE TEN NEW DIESEL locomotives, built to specifications furnished by the "New Haven," are highlights in latter day locomotive construction.

Three of the country's big fabricators, designers and assemblers of modern power units have contributed to this series of "all service" locomotives.

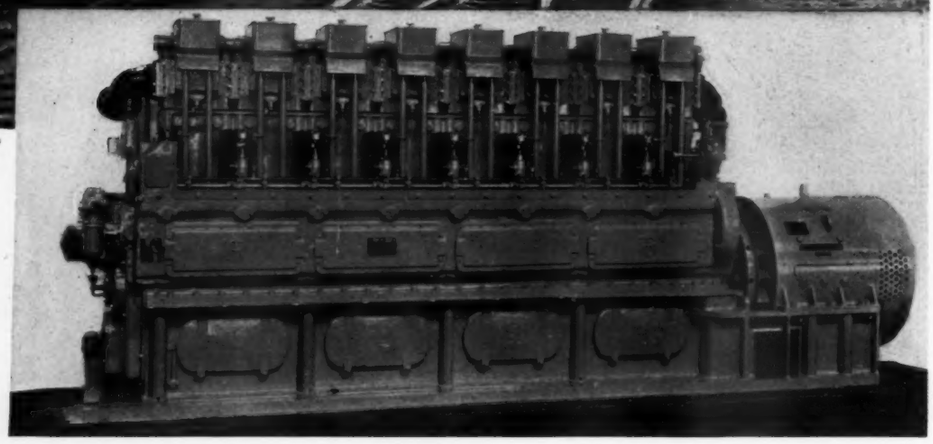
The General Electric Company delivered the finished power jobs from the Erie plant. They used five Cooper Bessemer Diesels and five Ingersoll Rand Diesels. It is significant that both the suction side of the fuel transfer pump, and the engine itself, were protected with Purolator Oil Filters, on each type of engine.

Purolators are frequently specified in important jobs of this character... and Purolator engineers invite your inquiries... both on standardized designs and any special filter problems that you have in mind. Motor Improvements Incorporated, Newark, New Jersey, makers of

PUROLATOR

THE OIL FILTER

New DIESEL SWITCHERS ON THE NEW HAVEN



The New Haven Railroad has recently placed in service five new Diesel switching locomotives equipped with Ingersoll-Rand Diesel engines incorporating the latest improvements.

These Diesel switchers are designed for twenty-four hour operation and will replace a greater number of steam switchers in use at Boston, Providence and New Haven.

Equipped with 600 hp. engines and weighing 100 tons each, with all the weight on the drivers, they are performing more work than the steam locomotives they replace with resulting economies in operation.

To date a total of 117 locomotives powered by Ingersoll-Rand Diesel engines have been sold. Each one of these locomotives is in operation today.

Atlanta
Birmingham
Boston
Buffalo
Butte
Chicago
Cleveland
Dallas
Detroit
Denver
Duluth
El Paso
Hartford
Houston
Knoxville

Ingersoll-Rand

11 BROADWAY, NEW YORK CITY

Los Angeles
Newark
New York
Philadelphia
Picher
Pittsburgh
Pottsville
San Francisco
Salt Lake City
Scranton
Seattle
St. Louis
Tulsa
Washington

"The BIGGER they are, the harder they fall!"

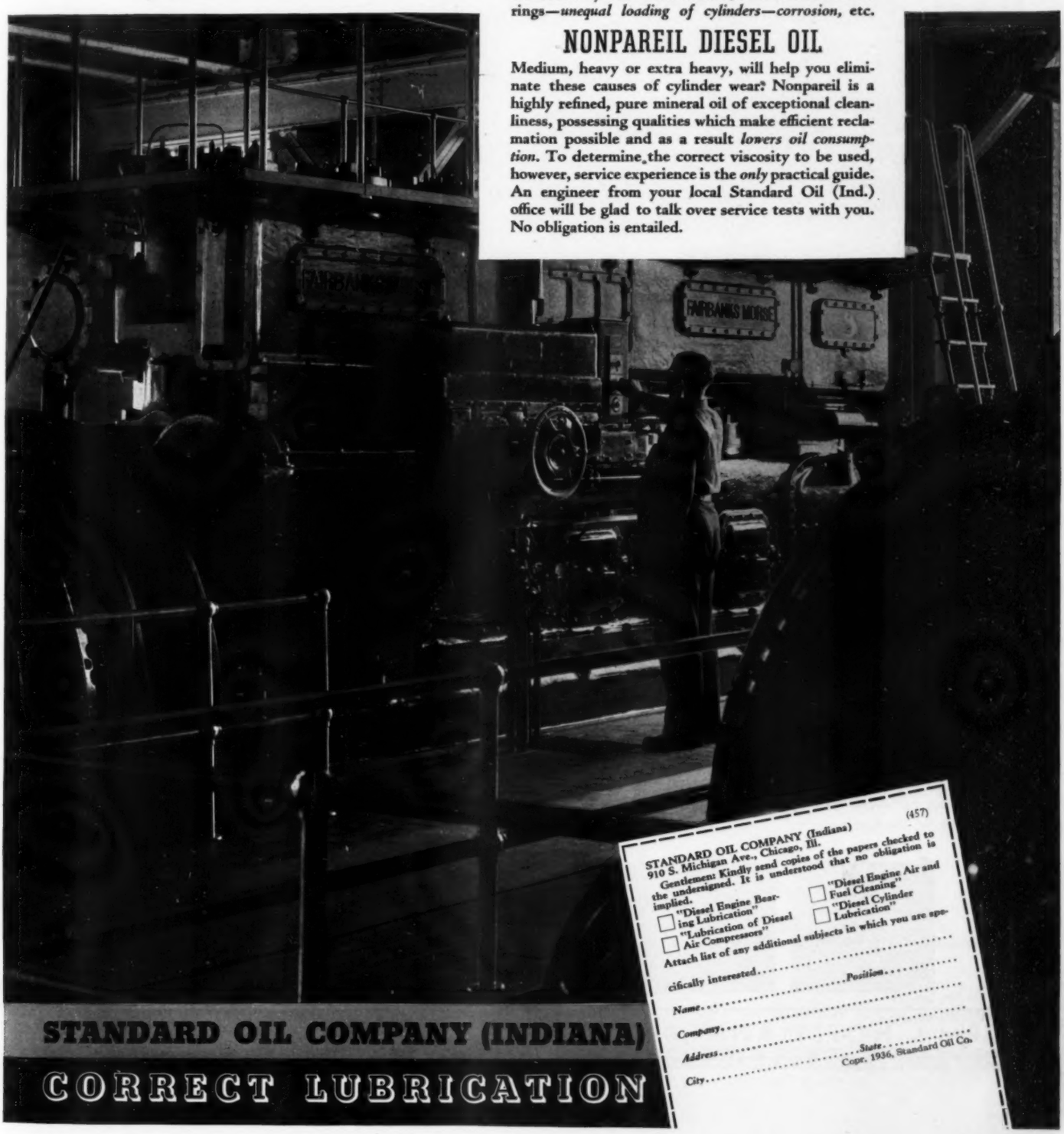
CYLINDERS are big. Pistons are big. Rings are big. When a shut-down occurs, *expense* is big—for cylinder wear runs up high costs.

Therefore, any reduction in Diesel cylinder wear can effect *large savings* in *maintenance* and *power!*

There are of course, many causes of cylinder wear: *dust,* drawn in with the air, adheres to working parts and finds its way into the lubricating oil—*dirty fuel* due to solid matter and water—*contaminated lubricants* due to metallic particles, or carbon and soot from blow-by—*excess lubrication,* which tends to stick rings—*unequal loading of cylinders—corrosion,* etc.

NONPAREIL DIESEL OIL

Medium, heavy or extra heavy, will help you eliminate these causes of cylinder wear? Nonpareil is a highly refined, pure mineral oil of exceptional cleanliness, possessing qualities which make efficient reclamation possible and as a result *lowers oil consumption.* To determine the correct viscosity to be used, however, service experience is the *only* practical guide. An engineer from your local Standard Oil (Ind.) office will be glad to talk over service tests with you. No obligation is entailed.



STANDARD OIL COMPANY (Indiana)
910 S. Michigan Ave., Chicago, Ill. (457)

Gentlemen: Kindly send copies of the papers checked to the undersigned. It is understood that no obligation is implied.

☐ "Diesel Engine Bearing Lubrication"
☐ "Diesel Engine Air and Fuel Cleaning"
☐ "Lubrication of Diesel Air Compressors"
☐ "Diesel Cylinder Lubrication"

Attach list of any additional subjects in which you are specifically interested.

Name.....*Position*.....

Company.....

Address.....*State*.....

City.....

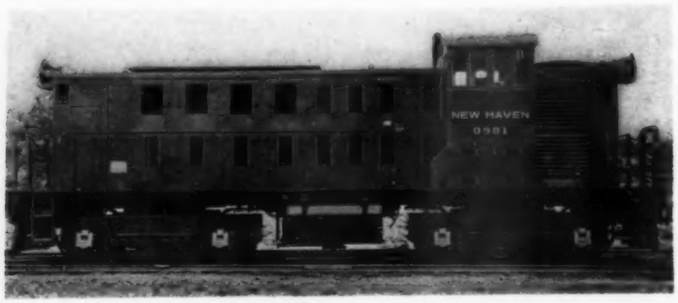
Copr. 1936, Standard Oil Co.

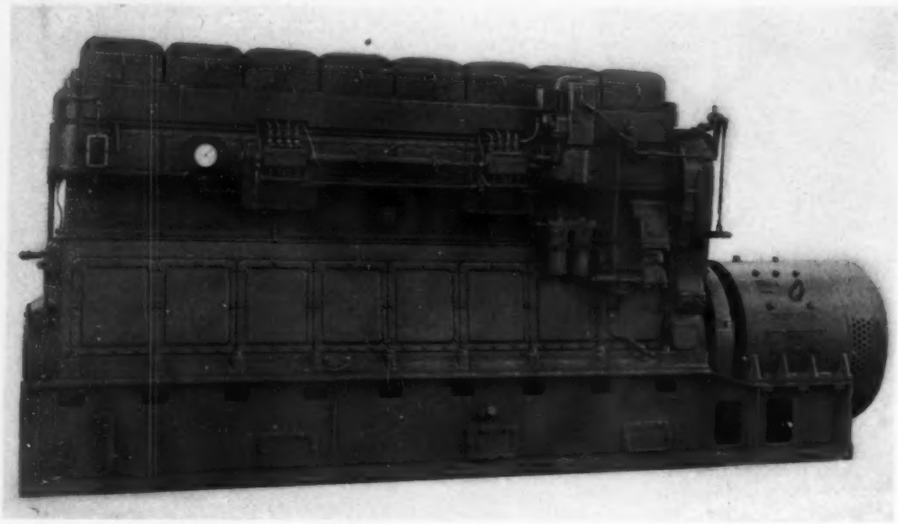
STANDARD OIL COMPANY (INDIANA)

CORRECT LUBRICATION

For These DIESEL-ELECTRIC SWITCHING LOCOMOTIVES

Built for N. Y., N. H. & H. Railroad





The COOPER-BESSEMER CORP'N. Selected

PRECISION BEARINGS

FIVE of these locomotives have been placed in service—each powered with a Cooper-Bessemer—General Electric unit. NORMA-HOFFMANN PRECISION BEARINGS were selected by Cooper-Bessemer engineers for the chain drive bearings for the layshaft and other mechanisms—for the cam shaft bearings and idlers—and for the water pump drive . . . . Engineers and designers find, in NORMA-HOFFMANN PRECISION BEARINGS, those rugged qualities which heavy-duty engine operation demands—loadability, speedability, and serviceability. You may have a similarly difficult bearing problem. Let our engineers work with you upon it.

The NORMA-HOFFMANN PRECISION line includes 108 distinct series, embracing over 3000 cataloged sizes—Ball, Roller, Needle and Thrust Bearings—a PRECISION Bearing for every load, speed and duty. Write for the Catalog.

NORMA-HOFFMANN BEARINGS CORP'N., STAMFORD, CONN.

Superior Model GA-4—30 K. W. Diesel Electric Generating unit in Sand and Gravel Plant, owned by J. S. Morie, Mauricetown, New Jersey.

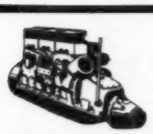
Mr. Morie has a typical Superior Diesel installation.

Correctly engineered—compact in design—clean cut in appearance—easy to operate and DEPENDABLE.

This installation and hundreds of others like it are building up a record of satisfactory service and low operating costs.

You, too, can increase your profits with Superior Diesels . . . Ask for Bulletin DPN-535.

Superior DIESELS



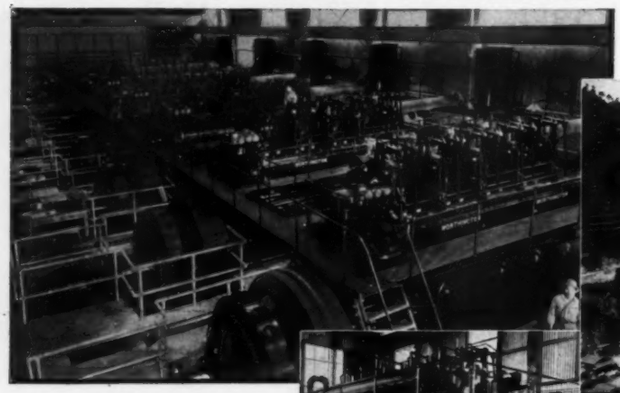
25 to 150 H. P.

THE
NATIONAL - SUPERIOR
COMPANY
SPRINGFIELD, O. . . . LOS ANGELES, CAL.

50 to 900 H. P.

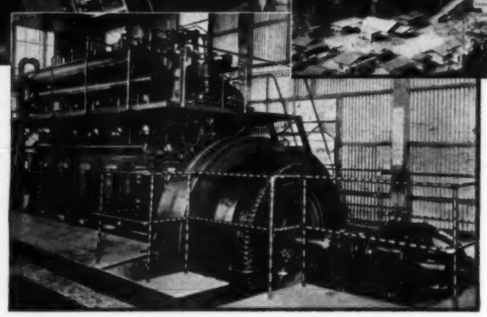
THE OTTO ENGINE WORKS . . . . PHILADELPHIA, PA.

15 WORTHINGTON DIESELS TO ONE MINING COMPANY IN PAST 3 YEARS



Engine house interior at Balatoc Mines. The eight Diesel engines are driving 625 kv.a. generators and exciters.

The Balatoc Mines property of the Benguet Consolidated Mining Company, where eight 625 hp. Worthington Diesels are in operation. The elevation here is 3000 feet. Farther back in the mountains is the Benguet Mine where there are six Worthington Diesels at work.



The Ipo Mine installation

IN 1933 the Benguet Consolidated Mining Company installed its first two Worthington Diesel Engines for power generation at its Balatoc Mines.

The continuously satisfactory performance of this initial installation determined the subsequent purchase of additional Worthington Engines for this and its other mining properties. To date a total of eight separate orders, covering fifteen Diesel engines, has been placed with Worthington to meet the expanding power requirements of this gold mining company.

Maintained economy and trouble-free operation have earned this confidence in Worthington Diesel Engines and the organization which produced them.

● TO POWER USERS IN EVERY INDUSTRY...

WORTHINGTON offers the services of an organization unsurpassed in its ability to analyze correctly any power problem ... with more than 35 years of successful engine building and application experience to support its recommendations.

WORTHINGTON PUMP AND MACHINERY CORPORATION

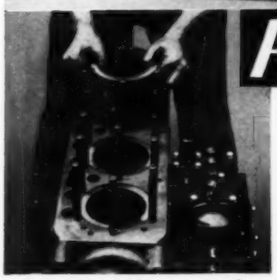
General Offices: **HARRISON, NEW JERSEY** - *Branch Offices and Representatives in Principal Cities throughout the World*

WORTHINGTON

ATLANTA BOSTON BUFFALO CHICAGO CINCINNATI CLEVELAND DALLAS DENVER DETROIT EL PASO HOUSTON KANSAS CITY LOS ANGELES NEW ORLEANS NEW YORK PHILADELPHIA PITTSBURGH ST. LOUIS ST. PAUL SAN FRANCISCO SEATTLE TULSA WASHINGTON

A-58881

America's FIRST Diesel-Powered Industrial Wheel Tractor . . . the new INTERNATIONAL ID-40



Replaceable cylinders—an example of the big money-saving features built into all International Tractors.

The Model ID-40 is as easy to crank as a gasoline tractor of corresponding size.

Power, Quality and Economy

● International Harvester, world's largest tractor builder, scores another *first* with the new Model ID-40. This organization has adapted the Diesel principle to wheel-type industrial tractor operation, the first time this has been done in America. This new tractor uses the same International Diesel engine that has proved so successful in the International TD-40 TracTracTor and the Model PD-40 Power Unit. The Model ID-40 Tractor has power and stamina to handle a variety of heavy-duty work calling for a wheel tractor. Investigate this new addition to the line of International Industrial Power, which includes wheel and crawler tractors, and power units from 12 to more than 100 h. p.

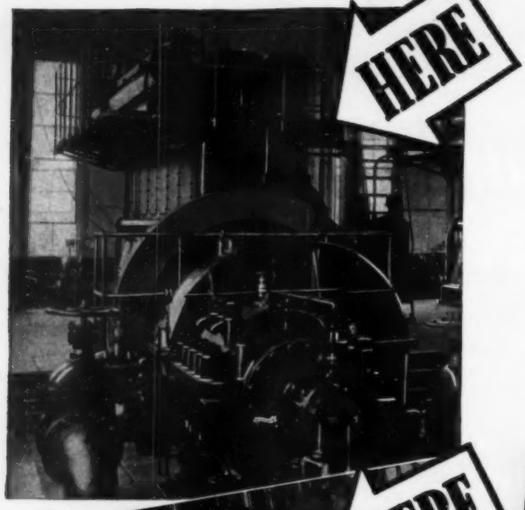
INTERNATIONAL Model I-40
This tractor is also new in the International Industrial Power line. It is similar in design and construction to the Model ID-40 but is powered with the efficient 6-cylinder gasoline engine used in the Model T-40 TracTracTor. Both of these tractors have the well-known features of International manufacture which mean so much to the user in low operating costs and maintenance economy.

INTERNATIONAL HARVESTER COMPANY
(INCORPORATED)
606 So. Michigan Ave. Chicago, Illinois

INTERNATIONAL HARVESTER

TEXACO AT WORK— IN OUR OWN DIESELS

is helping you get more out of YOURS



OPERATING Diesels totaling more than 50,000 h.p. on both land and sea, The Texas Company *proves* the quality of its Diesel lubricants before they are ever marketed.

Thus we are enabled to develop oils that meet exactly the most rigid requirements of Diesel operation. That is one important reason why . . . today . . . more Diesels are lubricated with Texaco Products than with any other brand.

Texaco is at work helping operators keep their Diesels on the job by avoiding stuck rings, blow-by, crankcase dilution, and frequent replacements . . .

Texaco Algol and Ursa Oils are made from crude especially selected for Diesel lubrication.

They are carefully refined to remove the last traces of harmful carbon and sludge forming elements.

A Texaco representative will be glad to provide practical engineering service to prove the economy of these products in your Diesels.

THE TEXAS COMPANY
135 East 42nd Street, New York City
Nation-wide distribution facilities assure prompt delivery

TEXACO

➔ VISIT THE TEXACO EXHIBIT—POWER SHOW—GRAND CENTRAL PALACE, N. Y., NOV. 30 TO DEC. 5, BOOTH 282.

TEXACO LUBRICANTS *for all types of DIESELS*

DIESEL PROGRESS

CONTENTS FOR NOVEMBER

	PAGE
NEW HAVEN TYPE DIESEL-ELECTRIC SWITCHERS	22
M.S. *SATURNIA*	26
HOTEL NEW YORKER	28
CATAPULTING FLYING SHIPS	32
ARCADE, N. Y.	35
LITTLE NOURMAHAL	38
LONDON LETTER No. 12	39
DIESEL TRAWLER, *STORM*	42
THE CRUISE OF THE *ISLANDER*	44

COVER ILLUSTRATION (by Edwin Levick) — The sun sets over the Diesel yacht *Nourmahal.* (See page 38 of this issue.)

TABLE OF CONTENTS ILLUSTRATION — Buda Diesel Tender for the yacht *Buccaneer.* With a speed of 17 mph. and capable of being hauled up by davits, this is an outstanding example of what can be done with a Diesel in light, fast craft.

Subscription rates: U.S.A. and Pan American Countries $3.00 per year; 25c per copy. Canada and all other countries, $5.00 per year; 50c per copy. 2 W. 45th St., New York City.

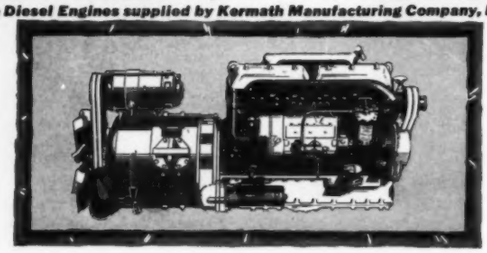
FORWARD—Twin Coach strides ahead! Its new, 41-passenger bus is equipped with Diesel electric power. And Twin Coach has chosen the Hercules Diesel for this modern development in efficient highway transportation. Advanced engineering, simplicity of design, light weight and reliable, efficient operation were the determining factors in the choice. Hercules is proud of its part in this forward-looking industry—its contribution to improved facilities for safe, comfortable and dependable highway travel. Hercules power, both gasoline and Diesel—first choice of leading bus and truck manufacturers—is the development of over twenty years of practical experience in the transportation field.

HERCULES DIESEL ENGINES

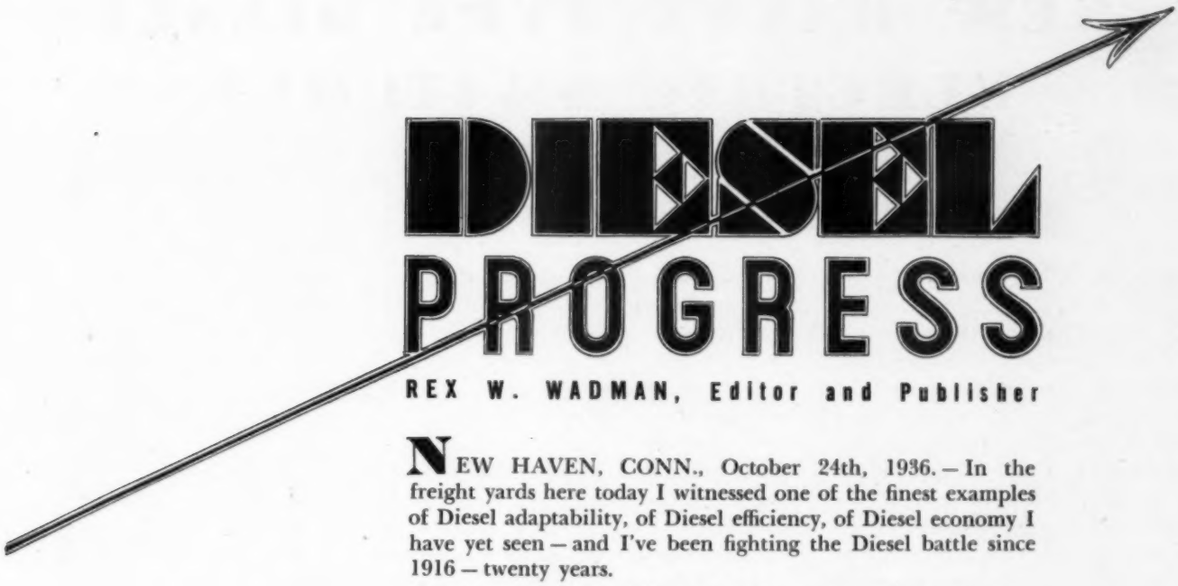
Hercules Marine Diesel Engines supplied by Kermath Manufacturing Company, Detroit, Michigan

HERCULES MOTORS CORPORATION
CANTON, OHIO

America's Foremost Engine Manufacturer
Power Plants from 4 to 200 H. P.



The Diesel electric drive pictured at left is mounted transversely in the rear of the Twin Coach shown above. The Hercules model DRXB, 4⅜" x 5¼", six-cylinder, high-speed, heavy-duty Diesel with electric generator.



DIESEL PROGRESS

REX W. WADMAN, Editor and Publisher

NEW HAVEN, CONN., October 24th, 1936. — In the freight yards here today I witnessed one of the finest examples of Diesel adaptability, of Diesel efficiency, of Diesel economy I have yet seen — and I've been fighting the Diesel battle since 1916 — twenty years.

The New York, New Haven and Hartford Railroad placed an order last spring for ten Diesel-electric switching locomotives, they have three of them up here in service now and the remaining seven are following right along. Eventually three of these new Diesel jobs will be assigned to the New Haven yards, two to the Providence, R. I., yards and five will go to work in and around Boston.

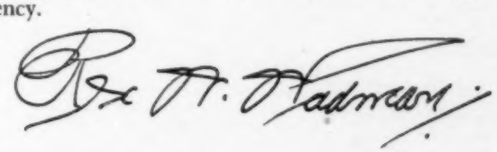
Remember that the New Haven Road is under re-organization, that it was hit terrifically by the hard knocks of the past five years, that it is one of our most conservatively managed roads — yet this Railroad, despite its financial problems and inherent conservatism, steps out and buys TEN new Diesel-electric switchers.

The New Haven Railroad bought one 100-ton, 600 hp. Diesel-electric switcher in 1931 and the record of this one Diesel unit faced the management this spring when the necessity arose for replacing some of their old switching equipment.

Twenty-four hour availability, low maintenance cost, ease of operation, flexibility of control, all these items showed up in the comparative cost of Steam versus Diesel operation— and so the order went out for ten new Diesel-electric switchers to replace, in effect, TWENTY old steam jobs, because that is what they will eventually do in daily service.

I saw these new Diesel jobs here today, watched them work and I'm proud of them — my congratulations go out to the General Electric Company, who built the complete locomotives and supplied the electrical equipment; to the Cooper-Bessemer Corporation and to Ingersoll-Rand Company, each of whom supplied five of the Diesel engines installed in these units. Clean cut, workmanlike, practical pieces of mobile equipment, well designed and splendidly built in every detail.

And so another step is taken in the Dieselization of our American railroads. Another great railroad sees the wisdom of meeting increased competition and rising operating costs with the one outstanding available weapon — Diesel economy plus Diesel efficiency.



NEW HAVEN TYPE DIESEL-ELECTRIC SWITCHERS

By P. H. HATCH, *N. Y., N. H. & H. R. R. Co. and* F. H. CRATON, *General Electric Co.*

THE six-wheeled steam switching locomotives (Class T-2-b) of the New York, New Haven & Hartford Railroad Company are now over 20 years old and many are approaching the stage when extensive general overhauls will be necessary. In 1931 the New Haven purchased a 100-ton, 600 hp. Diesel-electric switcher whose performance has been satisfactory, resulting in substantial economies. For these reasons, the New Haven decided to purchase ten additional Diesel-electric switchers for use in terminals where 24-hour service can be obtained from the new power.

Specifications on the basis of a Diesel-electric switcher to take the place of and do the work of a steam locomotive of the T-2-b class as well as part of the work of a Y-3 class locomotive were prepared and submitted to all interested bidders. The T-2-b locomotives weigh complete 119 tons, with 72 tons on drivers. Calculations showed that an 80-ton, 450 hp. Diesel-electric locomotive would do all the work in the switching speed range which a T-2-b steam engine would do; experience with the 100-ton 600 hp. Diesel-electric switcher had already shown that a locomotive of this weight and power was capable of performing the work in the slow speed range of an eight-wheel Y-3 locomotive with a total weight of 189 tons and a weight on drivers of 110 tons. Hence to anticipate future requirements and to provide a margin of capacity over present needs, the stipulation that the new locomotives should be able to do some Y-3 work was added to the specifications.

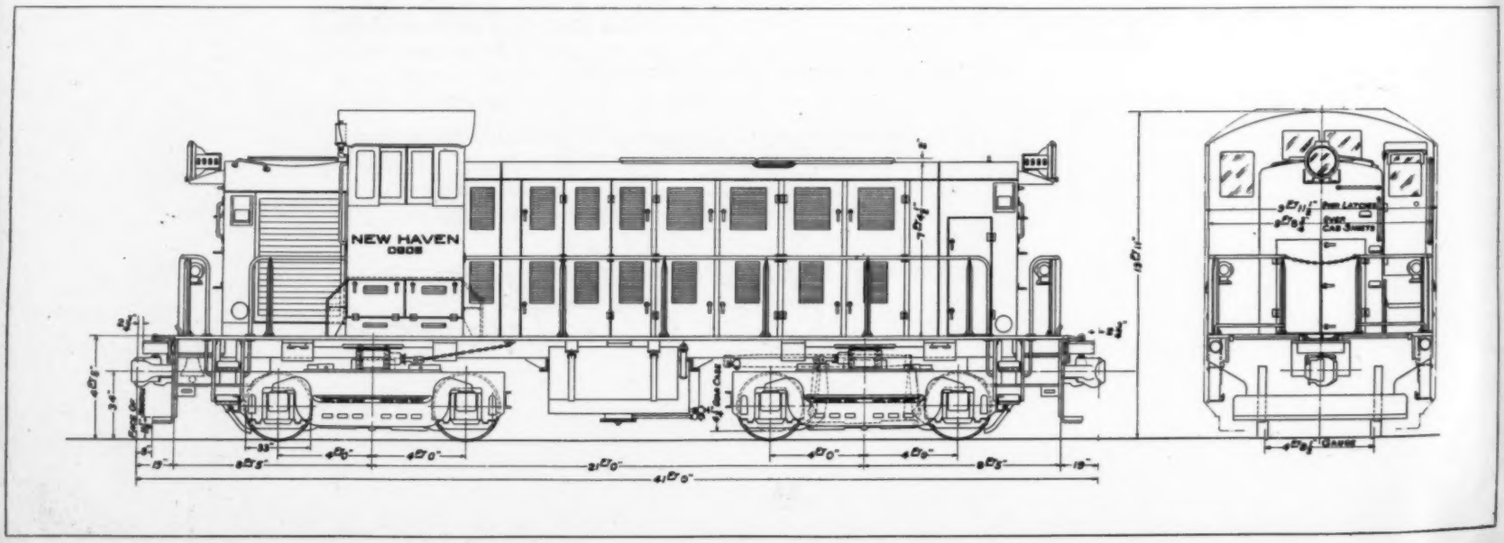
In order to insure the widest possible utility, certain maximum allowable T-2-b dimensions were given, superimposed on the clearance diagram for equipment operating in the electric zone, *whichever was limiting.* Total weight was specified as not to exceed 100 tons, all on drivers, and wheel loading and spacing to permit operation of the Diesel-electric switcher on any structure suitable for a T-2-b was given. The new locomotives, therefore, would be able to operate anywhere on the railroad that a T-2-b locomotive is permitted, and, with certain restrictions regarding minimum curve, in third rail territory also.

Further along the line of maximum utility the locomotives were to be arranged for both passenger and freight switching.

A single Diesel engine-generator set was specified as preferred, in view of the advantages of simplicity, accessibility, and fewer parts to service and maintain. Other items of arrangement, material, construction and so on were specified in line with the preferences or standards of the railroad.

Another of the features proposed was the use of axle hung traction motors geared to the axles by means of integral double reduction gearing. Motors of this type had been built previously for street car service, but not for heavy locomotive use. There were, however, three factors which favored the proposed motor: (1) increased efficiency by reason of high (motor) speed, (2) small size and light weight of the motor, (3) the fact that the intermediate gear would be built into the motor and pinion housing in such a way that mounting of the motor in the truck and removal therefrom would conform in all respects to standard practice.

Still another proposal was the elimination of any auxiliary generator and the employment of the main generator for auxiliary power at both idling and full speeds of the Diesel engine. It seemed that the advantages of this would more than outweigh the small additional complication involved in arranging some of the auxiliaries for double voltage operation.



The last but not the least problem of importance was the selection of the Diesel engine. Two different makes of engines had been proposed for these locomotives – one a 10½" bore by 12" stroke, 8-cylinder, four-cycle, solid injection, non-supercharged Cooper-Bessemer engine rated 660 bhp. at 750 rpm., the other a 10" bore by 12" stroke, 8-cylinder, four-cycle, solid injection, non-supercharged Ingersoll-Rand engine rated 600 bhp. at 750 rpm. Overall dimensions of both engines with respect to locomotive mounting were comparable, and construction of the engines, while of course differing in details, was in general similar.

It was the railroad's desire to obtain five of each of these makes of engines and install them in ten identical locomotives. Hence five locomotives were ordered from the Cooper-Bessemer Corp., and five from the Ingersoll-Rand Co., the General Electric Co. building the locomotive portions. It was furthermore desired to coordinate the engines and engine auxiliaries as far as possible. Final design of the locomotives, therefore, was undertaken along these lines and the result has been ten locomotives exactly alike in all respects except for Diesel engines; Diesel engine coordination has been carried out to the extent that it is possible to remove an engine of one make and substitute an engine of the other make in the same locomotive without changes in connections or alterations in mounting or equipment.

Since this is the first time that coordination of two different makes of Diesel engines has been attempted, a description of the process involved and the equipment affected may prove of interest.

A series of coordination conferences was held at which were represented both engine builders, the locomotive builder and the railroad.* Minutes of each meeting were kept and sent to all interested parties, so that a continuous record of deliberations was at all times available.

Coordination was carried out along three lines. One was the determination of the maximum operating characteristics of the two engines from a study of which could be designed a common set of engine auxiliaries and secondary apparatus, including parts of the electrical equipment; another was the coordination of all operating procedures so that with minor variations the same set of instructions could be used with locomotives having either make

of engine; the third was the actual employment for both engines of the same auxiliary parts.

One of the first major considerations was the design of a generator which with its field control equipment would have a speed-torque characteristic suitable for both engines. Each builder, therefore, submitted a permissible speed-torque curve for his engine and a generator was designed with acceptable characteristics over the entire speed range. Governed speed at full load was set at 770 rpm. for each engine, the speed control equipment being designed to maintain speed at full load just under this, or at 750 rpm. It can thus be seen that there will be no conflict between engine governor and electrical governor.

To design suitable starting characteristics for both engines, the engine builders furnished information regarding maximum torque required at breakaway to overcome compression at 32 deg. F., torque at minimum firing speed at 32 deg. F., and minimum firing speed in rpm. With this information and knowing the battery characteristics, the starting winding on the generator could be correctly designed and proportioned for starting both types of Diesel engines. Rotation as finally agreed upon for both engines was clockwise facing the generator end. Mechanical design of the generator and coupling as they affected the rotating systems of the engines was given very careful attention. The final design incorporated WR^2 and stiffness factors acceptable to both engine builders. Idling speed was finally decided upon as 300 rpm. at full auxiliary load of 40 hp.

A new flexible coupling was designed for use with both engines. This coupling employs steel discs which transmit torque in compression and allow slight movements longitudinally by bending. Engine flywheels to which the couplings were attached were different, but were made suitable for attaching the same generator fan.

After collecting from each engine builder data regarding heat rejection to cooling water, engine outlet water temperature, water pump delivery and head, etc., a water cooling system was designed which was suitable for both engines and which had incidentally an inherent capacity suitable for the larger engine operating continuously at full load in an ambient temperature of 100 deg. F.

Two Nugent type 1116-TB-4L lubricating oil filters were installed for each engine. The filters are connected in parallel, and together handle the entire lubricating oil circulation.

Low pressure fuel oil systems were completely coordinated, and consist of a motor driven transfer pump, a type G-49-J-14 Purolator filter with .003″ spaces on the suction side of the pump and a type D-71-JWM Purolator on the discharge side, with necessary trip, relief valve, pressure gauge, etc. While it was the railroad's desire to conform to its other Diesel-electric equipment and maintain 35 lbs. pressure on the discharge side of the transfer pump, it was necessary to drop this to 10 lbs. for one make of engine on account of characteristics of the high pressure pump.

No coordination was attempted on the high pressure fuel systems of either engine, partly because of the inherent differences between the so-called "common rail" and "jerk pump" systems, and partly because it was not desired that changes be made in fundamental parts of the engines.

The combined exhaust manifold and muffler arrangement was desired on both engines, but cylinder head exhaust connections on one type of engine were not suited to this. Hence one engine has two separate Burgess mufflers mounted on it and the other uses two Burgess manifold mufflers — in each case one muffler for each four cylinders. Mufflers were made integral parts of each engine both for the sake of interchangeability of the Diesel engines as between locomotives and to keep mufflers off the top of the locomotive to improve visibility from the cab.

Four Air-Maze intake air filters of the same type and size were used on each engine. The housings, however, on the two were of different size and arrangement; on one the filter units themselves extended the length of the engine and came out close to the upper row of louvers in the hood; on the other there was a form of air duct at each end leading to a common housing in which were the filter units. In order to gain a direct operating comparison between two types of speed control equipment, the Woodward governor was furnished on one type of engine, and a mechanical type with servo-motor on the other.

Both engines were equipped with overspeed trip, lubricating oil pressure relay to protect against low oil pressure, and solenoid operated fuel shut-off device.

One engine, therefore, had a Woodward governor, a solenoid operated dump valve included in the governor assembly to shut off the fuel supply, a Detroit Lubricator Co. pressure switch and an overspeed trip driven from the engine and fitted with electrical contacts. The other engine had its own make of governor, a solenoid operated mechanism to move the fuel racks to the off position, the same Detroit pressure switch, and an overspeed trip built into the engine and engaging a toggle switch. In both cases, the action of either the pressure switch, or the overspeed trip, or pulling the "engine run" button out in the cab, opens the circuit to the fuel shut off solenoid and shuts down the engine.

In other respects, including the point on each engine to which connection is made, the throttle mechanism was made identical both as regards operation and adjustments.

Perhaps the most noteworthy feature of the mechanical structure is its all welded construction including the truck frames. Concomitant with the progress being made in welding is increased confidence in its use for railroad work.

The weight of the locomotive is carried entirely on nests of coil springs mounted between the truck frame and equalizers. The construction is simple and the riding qualities of the locomotive exceptionally good. Additional features are the combined side bearing and locking arrangement, and the truck swivel limiting member which is attached to the front cross tie contacting pads on the draft gear housing. Lateral thrust of the axle is taken by thrust blocks mounted in the journal boxes opposite the ends of the axle.

The underframe is built up around a main slab 37′ 11¼″ x 117″ x 1½″ forming the platform and mounted on two 37′ 7½″ x 10″ x 6½″ center sills running the entire length and forming a tremendously stiff "backbone" for absorbing buffing shocks as well as supporting the main items of equipment. Bumper beam, box structure for reinforcing the ends, draft gear housing, bolster plates, center bearings and buffers are of wholly fabricated welded construction.

The cab and hood are of welded construction throughout. The section of the hood over the engine-generator set is removable and furthermore may be removed without disturbing any of the major piping. For minor work on top of the engine, a hatch is provided in the roof.

Accessibility of equipment was one of the major objectives of the design since good accessibility goes a long way toward assuring low maintenance costs. The following points are of especial interest:

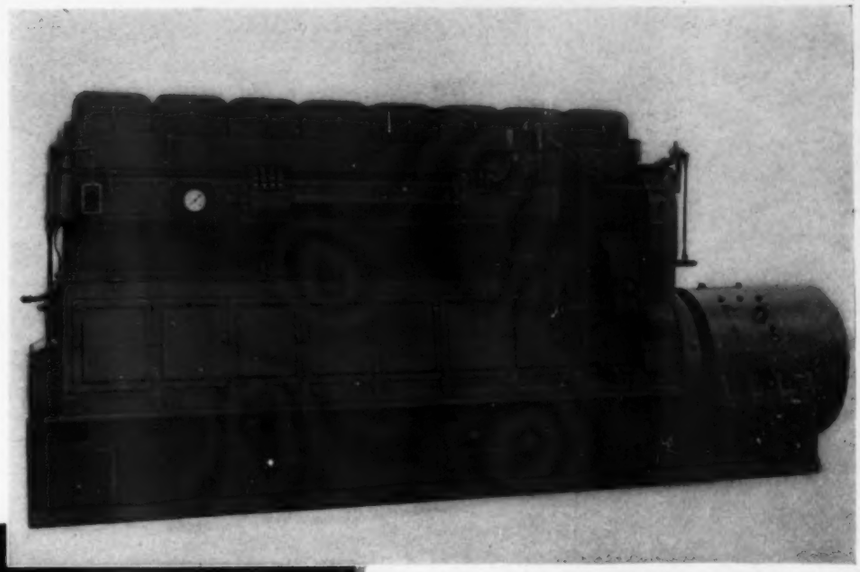
1. Radiator sections can be removed singly from the platform.

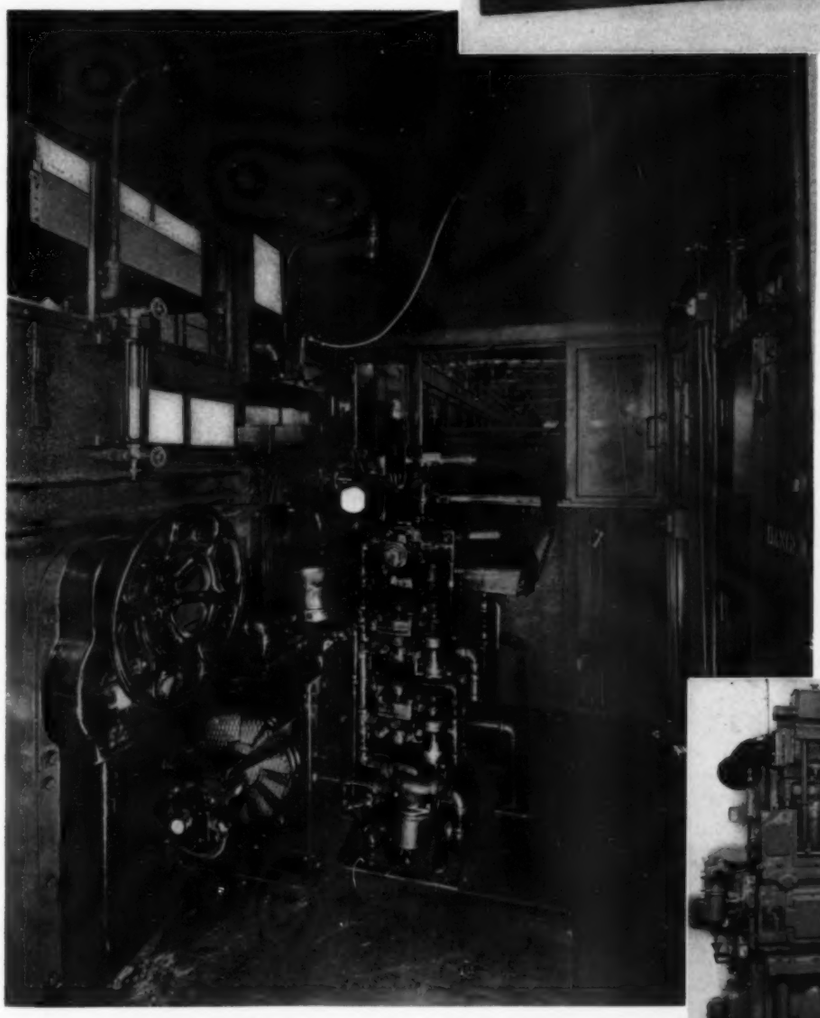
2. Radiator blower motor reached from inside radiator compartment and lifted out through the fan cone. (Radiator compartment reached through door in operating cab.)

3. Distributing valve mounted in radiator compartment and feed valves in operating cab.

4. Contactors, relays, reverser, etc., reached from operating cab through folding doors and resistors from generator compartment.

5. Batteries reached from ground through drop doors on sides of operating cab.





The 660 hp. Cooper-Bessemer Diesel installed in New Haven locomotives 0901-0906 inclusive. Below — The Ingersoll-Rand 600 hp. Diesel which drives the New Haven locomotives 0907-0910 inclusive. Left — A view of the operating cab which is identical for all ten units.

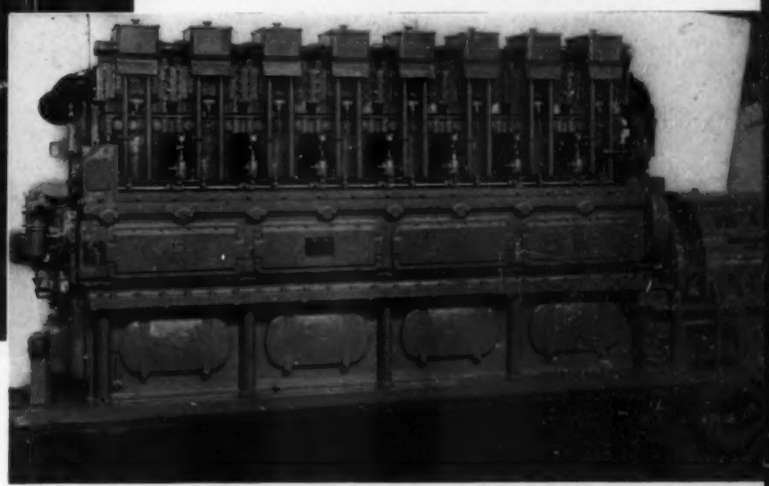
6. Generator in separate compartment from Diesel engine and reached through hinged doors from the platform.

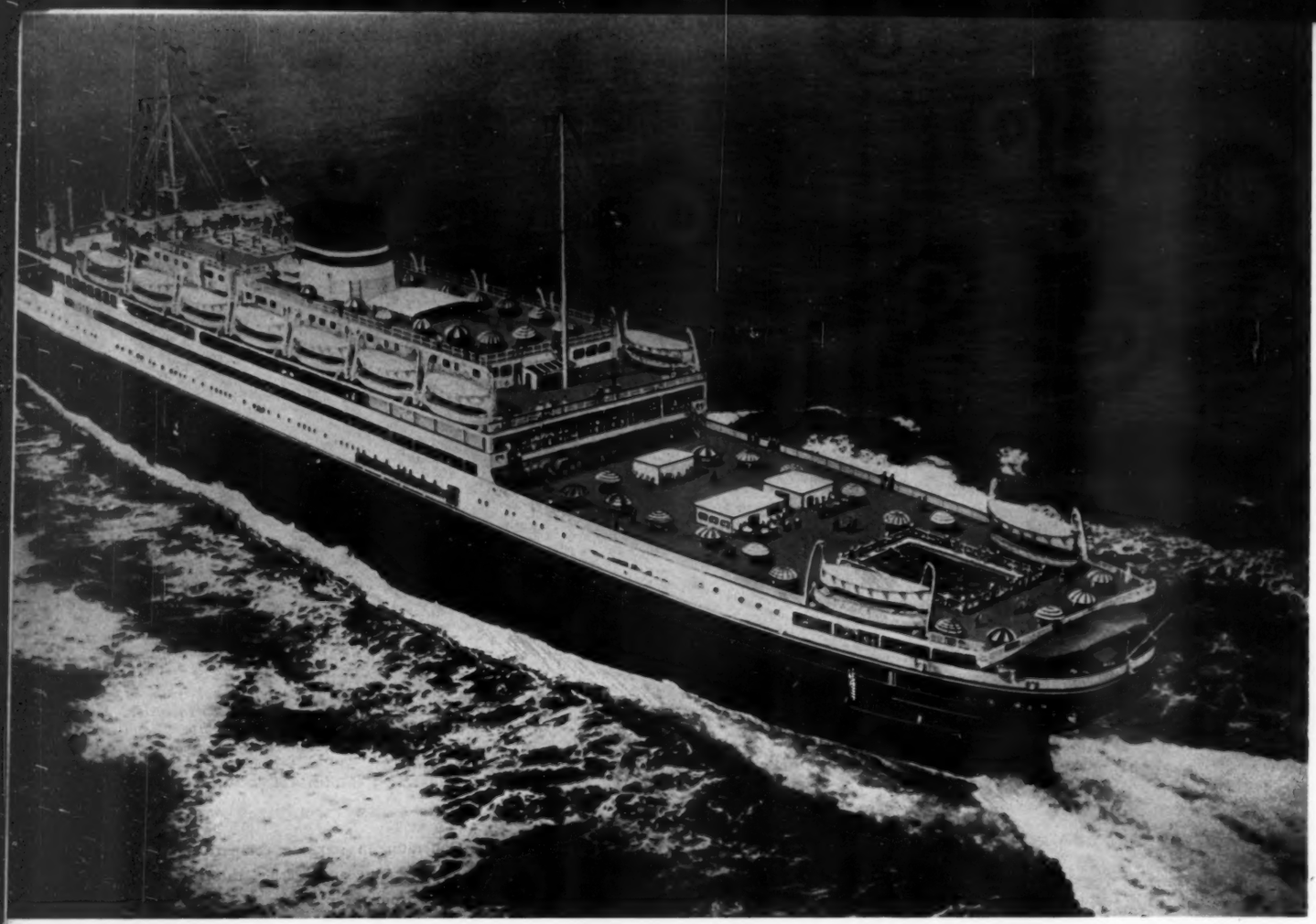
7. All sides of the compressor accessible through doors in hood.

8. Access to entire length of engine from top to bottom on both sides provided by a series of hinged doors along platform.

Particular pains were taken in laying out the control station so as to provide greatest convenience for the operator and best possible visibility. The controls are convenient regard-

. . . . . *And now please turn to page 58*





M. S. SATURNIA

"The Most Powerful Diesel Liner Afloat"

By ANTONIO GIORDANO

THE M.S. *Saturnia* of the Società Triestina di Navigazione Cosulich, after having been fully overhauled by the Monfalcone Yard of the C.R.D.A. and re-engined by the Fabbrica Macchine S. Andrea of the C.R.D.A., left Trieste on her maiden trip on August 20, 1936.

The propelling machinery which has been fitted in the main engine room, left unaltered in its size in spite of the fact that the power of the new engines is larger than that of the previous engines at the rate of 50 per cent, consists of two C.R.D.A.-Sulzer engines of the normal contract power of 12,000 hp., each at 125 rpm., fully built at the Fabbrica Macchine S. Andrea of Cantieri Riuniti dell' Adriatico.

Each engine consists of 10 double acting two stroke cylinders, having a diameter of 760 mm. and a piston stroke of 1,200 mm. with direct fuel injection, and independent scavenging, refrigerating and lubricating pumps.

Among the striking features of these engines may be mentioned the great simplicity reached in the structure and in the details of such machinery. The 10 cylinders are divided in two groups of five, and in the central part of the engines are situated the transmission gears for maneuvering the camshaft. The camshaft runs all along the engine, and is letting the fuel pumps to act (one for each cylinder). Each pump, which can be easily overhauled, consists of a body, in which are fitted three small pistons; one for the pulverizers of the upper stroke, the other two for the two pulverizers of the lower stroke.

The inversion of stroke is obtained by shifting longitudinally the camshaft, so that the cams may come into contact with the respective rollers of the fuel pump for the running ahead or astern.

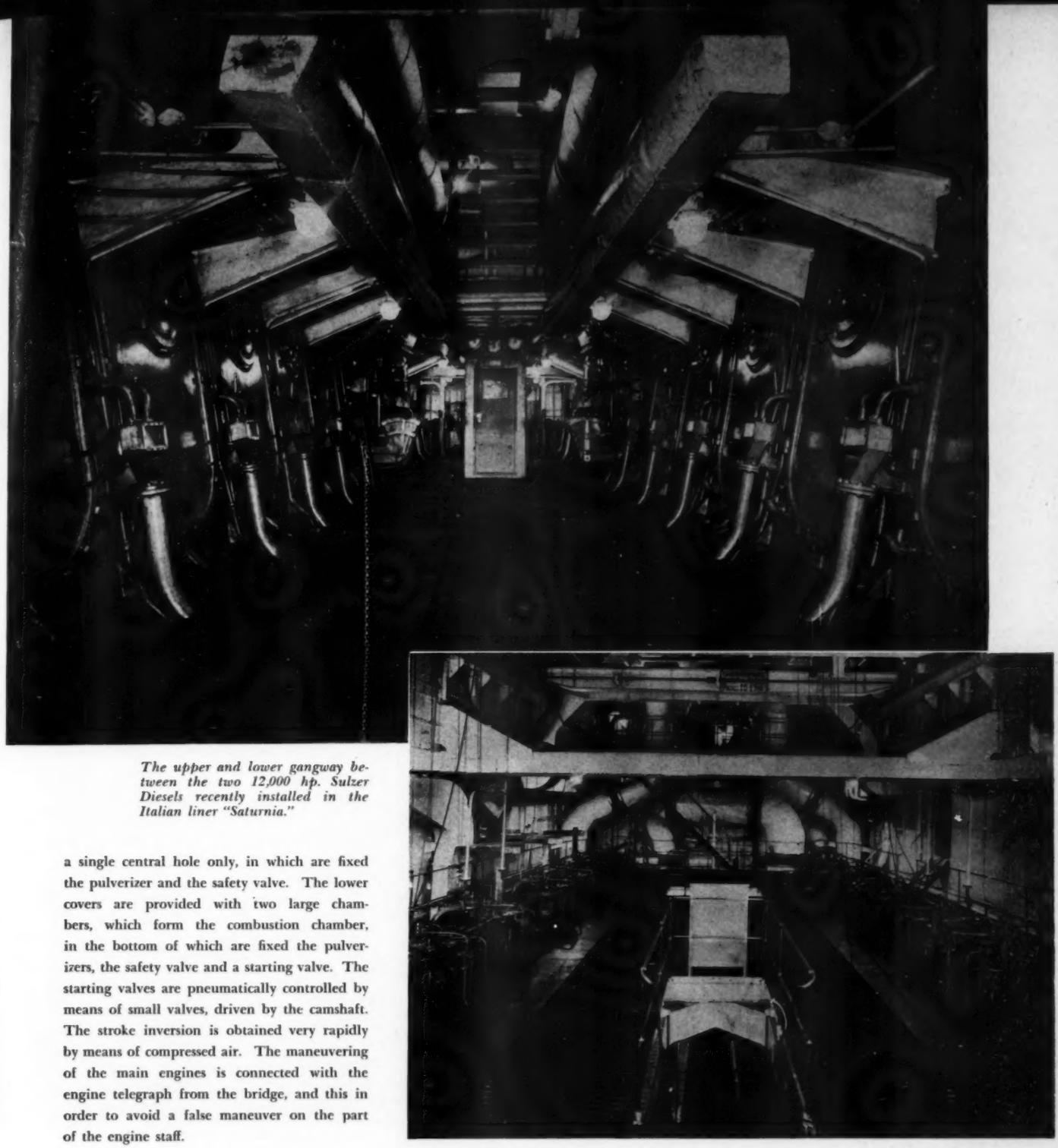
The cooling of the motor is effectuated by means of fresh water circulation with double head: 30 m. for the cylinders, 50 m. for the pistons.

The lubrication is a forced one, and at low pressure for all the apparatuses, the pins of the cross head included. The piston rod is protected from the action of the gases and cannot come into touch with the circulating water; in this way are excluded the corrosions of the piston rod.

The piston consists of three parts: the two extreme parts are in forged steel, while the intermediate part, which constitutes the guide of the piston of the cylinder, is in cast iron.

The scavenging and discharge ports on the cylinders allows a particularly efficient scavenging of the cylinder, and a light overcharge of scavenging air.

The upper covers of the cylinders are carrying



The upper and lower gangway between the two 12,000 hp. Sulzer Diesels recently installed in the Italian liner "Saturnia."

a single central hole only, in which are fixed the pulverizer and the safety valve. The lower covers are provided with two large chambers, which form the combustion chamber, in the bottom of which are fixed the pulverizers, the safety valve and a starting valve. The starting valves are pneumatically controlled by means of small valves, driven by the camshaft. The stroke inversion is obtained very rapidly by means of compressed air. The maneuvering of the main engines is connected with the engine telegraph from the bridge, and this in order to avoid a false maneuver on the part of the engine staff.

During the trials undertaken at the test bed the engines have shown to have a very large margin of overload, having reached with great facility, after only 20 hours of running, a power of 19,500 bhp. at 144 rpm., and successively a maximum power of 20,820 bhp. At the contract power of 12,000 bhp. per engine, the consumption resulted to be of .332 pounds per hphr., viz., 15 per cent lower than the contract consumption.

In the main engine room all the auxiliaries have been renewed, including the fresh water and oil pumps, as well as the coolers, etc. For the scavenging air, three turbo-blowers have been provided, one of which as a spare blower.

In the auxiliary engine room, situated forward, the two motor compressors, which were supplying the injection air to the previous engines, have been transformed into two electric generating sets of 900 kw. each.

In connection with the passengers' accommodation overhaul and reconstruction it may be mentioned that the works carried on the M.S. *Saturnia* slightly differ from the work carried out on the M.S. *Vulcania*. For the first class

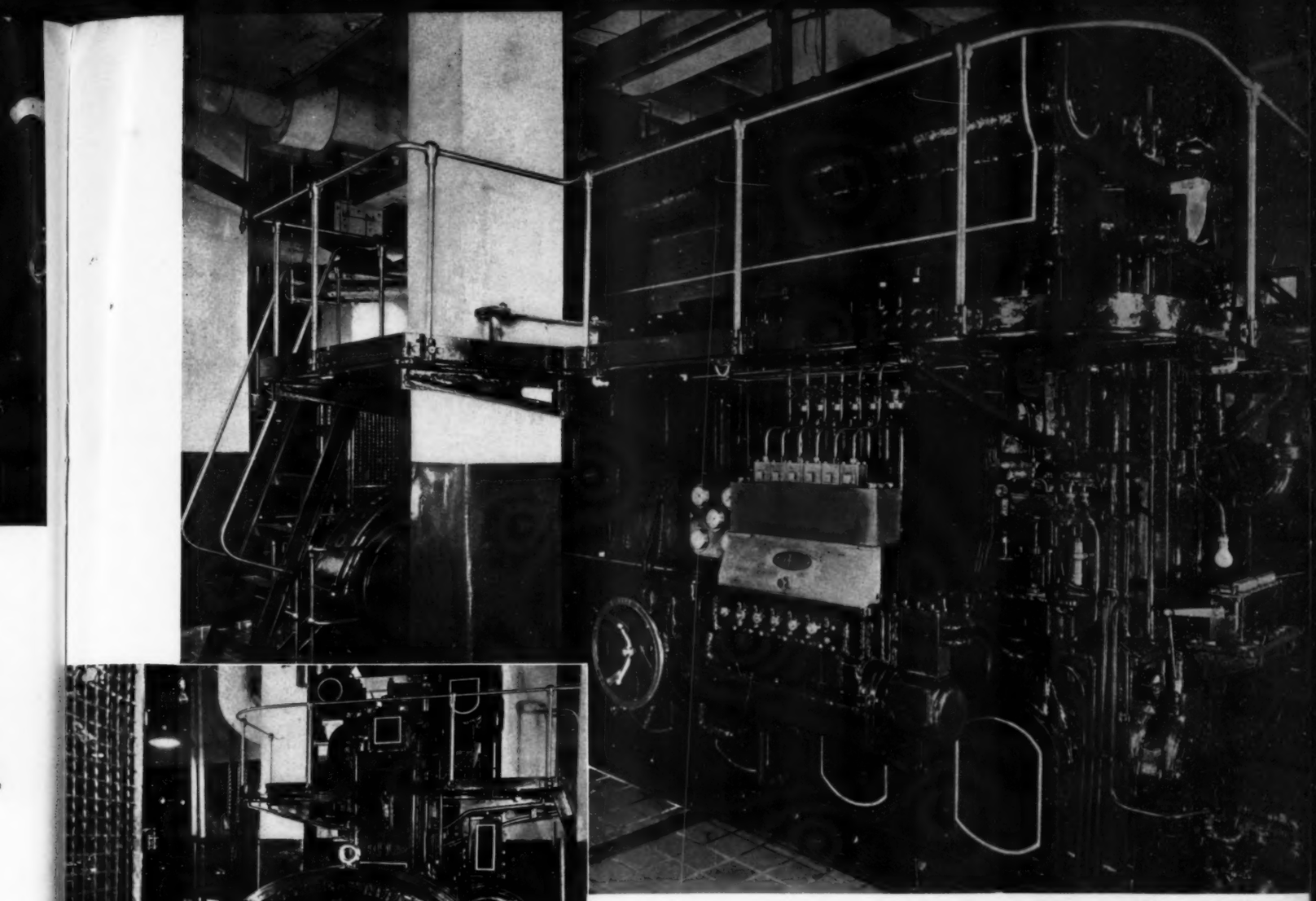
. . . . *And now please turn to page 47*

Chief Engineer Lewis instructs Ralph Hitz, Jr., son of the New Yorker's Manager, how to start the new Busch-Sulzer Diesel and to throw the generator onto the load line.

HOTEL NEW YORKER

ONE of New York City's most modern hotels, the New Yorker with 2,500 rooms was erected in 1930. Early in the design it was decided to install a complete power plant instead of using purchased electricity and steam. This immediately raised the question of expensive utility break-down service so that it was further decided to add a Diesel engine for standby duty. The popularity of the hotel increased steadily despite the depression and with it the demand for electric current. Installation of new equipment such as air conditioning apparatus further added to the power requirements so that this summer, only six years since the New Yorker opened its doors, it was necessary to add a second Diesel of 750 hp.

Due to a remarkably even balance between power and heating demands plus steam requirements in the laundry, it was economical to use boilers and uniflow steam engines for the main plant which totals 2,200 kw. The new Diesel is a six-cylinder, four-cycle Busch-Sulzer and drives a 500 kw. Crocker-Wheeler generator at 300 rpm. This raises the total Diesel standby power to 850 kw. so that it is now possible to obtain more economical power



Auxiliary equipment installed with the Diesel includes an Alnor pyrometer, American Air filters, Woodward governor, Goulds' Hydroil lubricating oil purifier and Cuno fuel oil filters.

generation during the non-heating months of the year. In other words it is now possible to shut down one of the boilers completely and save the considerable difference in cost between non-condensing steam operation and Diesel operation on an appreciable portion of the total load. This saving of course is in addition to the previously mentioned saving on utility breakdown service. Further saving will be effected by utilizing warm condensing water from the refrigeration plant as Diesel jacket water and finally as pre-heated boiler feed water.

The new Busch-Sulzer Diesel was purchased under specifications prepared by Werner Nygren, Inc., Consulting Engineers and the actual installation was extremely difficult since the power station is located four stories below street level. In addition, it was necessary to maintain operation of existing machinery during the installation and, lastly, to excavate through solid rock to a depth of eleven feet for the foundation. Vibration isolation was effected by the Korfund Company who installed Base and Side Isolators of four and three inch cork respectively. The concrete base was then poured directly on the cork plates. As a result, guests of the hotel and pedestrians at the corner of 34th Street and 8th Avenue will have no indication that this large Diesel is operating directly beneath them. Another Diesel engine is serving its owners quietly, safely and economically.

Marie S. Moran

1st.

WINTON DIESEL POWERED TOWBOAT IN A FAMOUS FLEET

Six-cylinder 14½" bore by 21" stroke Winton-Diesel engine developing 550 h.p. recently installed in *Marie S. Moran*

MORAN TOWING AND TRANSPORTATION CO., INC., SELECTS

WINTON-DIESEL POWER FOR MORE *Economical* AND *Dependable* WORKBOAT OPERATION

THE trend of the marine world to Winton-Diesel power is well exemplified by circumstances leading to the recent Winton installation in towboat *Marie S. Moran* . . . first Diesel-powered vessel in the forty-boat fleet of the Moran Towing and Transportation Company, Inc. Seeking more efficient workboat operation, the Moran Company, oldest and largest towboat operators in the world, selected Winton power for *Marie S. Moran* to test first-hand the advisability of Winton-Diesel power as replacement equipment for their present fleet. The venture proved successful. *Marie S. Moran* recently completed a trial run of 2,000 miles, the longest ever achieved in towboat history. Throughout her spectacular run in heavy seas, against high winds, her powerful Winton engine proved its exceptional merits as a means to dependable, low-cost performance. This boat was built by the Pennsylvania Shipyards at Beaumont, Texas, designed by the Moran Company and is powered by a six-cylinder, 14½" bore by 21" stroke Winton-Diesel engine developing 550 h.p. *Marie S. Moran* has an overall length of 89 feet, beam 22 feet, draft 9 feet, 3 inches, and is unusual and distinctive because of her modern equipment. She will be used in general towing service, including the docking of such super-liners as the *Normandie* and *Queen Mary*.

WINTON ENGINE CORPORATION

CLEVELAND · · OHIO · · U. S. A.

M.S. "Schwabenland," one of Deutsche Lufthansa's sea bases.

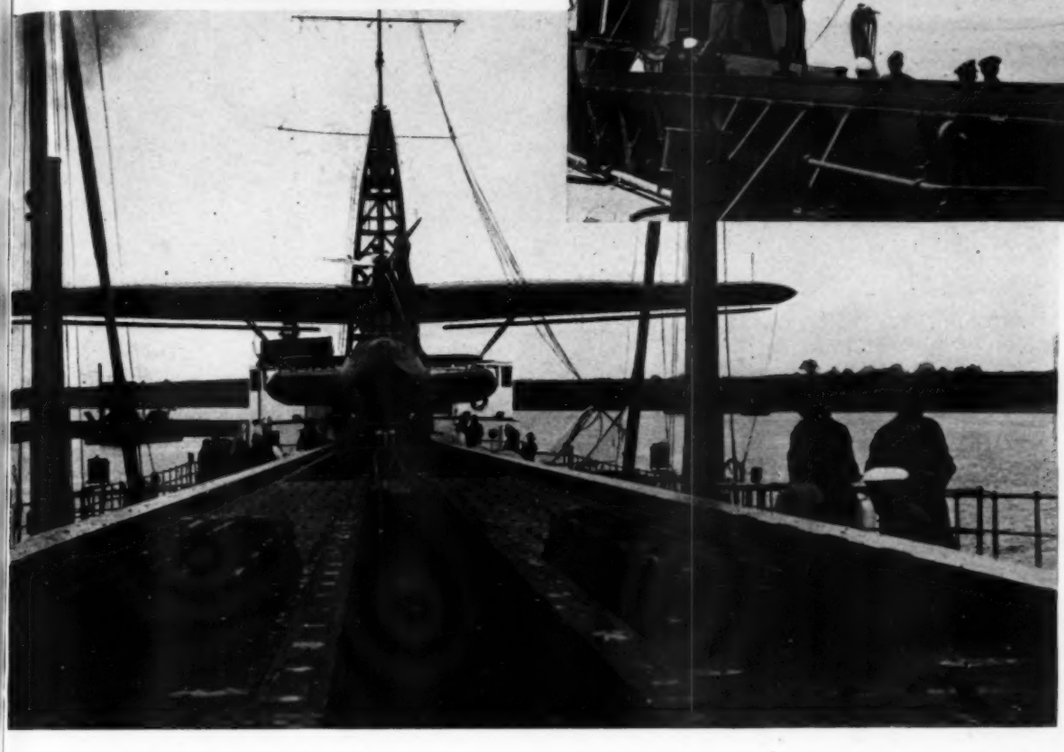
CATAPULTING FLYING BOATS

By PAUL H. WILKINSON

THE recent visit to this country of two Dornier flying boats, pioneering the route across the North Atlantic for Deutsche Lufthansa, clearly indicates that a regular forty-eight hour air-mail service will be in operation between Berlin and New York next year. Although the small Dornier *Do 18* planes accomplished all their routine flights quite successfully, they did not have any appreciable margin for payload. For the regular air-mail service, two larger planes, each equipped with four Diesel engines, are nearing completion.

Another catapult ship is being built for the North Atlantic service, which will give Deutsche Lufthansa a fleet of four of these "mother ships" – two for the northern service and two for the South Atlantic as before. Although catapulting cannot be used for passengers, it works out very well for mail planes, particularly in the case of Germany whose problem of sea-bases is much more difficult than for other countries.

Soon after the *Zephir* and the *Aeolus* arrived



Hoisting a Diesel-engined seaplane aboard the catapult ship "Ostmark."

The "Aeolus" on the "Ostmark" before the masts are lowered for take-off.

Upper left — Connection between hull of flying boat and cradle, showing slotted thrust arm.

at Port Washington marine base last month, the opportunity was given to see how the catapulting of these flying boats actually takes place. The catapult shoots the planes over the stern of the *Schwabenland,* whereas on the newest ship, the *Ostmark,* the plane is shot over the bow. The latter arrangement is preferable as the ship can then proceed against the wind for the take-off. However, the existing arrangement on the *Schwabenland* apparently gave every satisfaction.

The catapult mechanism is naturally of very sturdy construction. The length of the track on the *Schwabenland* is 103 ft. and the width between the rails is 7 ft. 3 in. These dimensions are standard for all the catapult ships. Using an air pressure of 2,350 lbs. per sq. in., a flying boat weighing 15 tons can be given a maximum acceleration of 3.5 g. (112 ft. per sec.), so that the plane attains a speed of 93 mph. as it leaves the catapult.

Underneath the track is a huge cylinder about 16 ft. long which contains a piston about 24 in. in diameter. To give the cradle on which the seaplane rests its impetus, two steel cables, passing around a series of drums, are used. The cradle slides on steel rails thickly coated with grease. Toward the front end of the track are arresting devices to stop the cradle suddenly, while the plane continues its forward motion and takes to the air.

To secure the flying boat to the cradle, four short arms are used. The front pair are merely

A corner of the pilots' cabin aboard a Dornier "Do 18" flying boat. In the center are the pump (throttle) and radiator shutter control levers.

The "Aeolus" leaving the catapult.

used to steady the front part of the hull and drop when the cradle begins to move. The rear pair, one of which is shown in the illustration, transmit the thrust from the cradle to the hull near the step or center of gravity. As these rear arms are slotted, the plane leaves them immediately the cradle begins to stop at the end of its run.

The flying boats are hoisted on board with the crane, and there is room for two of them on the ship at the same time – one on its cradle on the track, and the other on a support nearby. The *Zephir* made a demonstration flight from the *Schwabenland*, and the *Aeolus* was also catapulted before an interested group of people as it commenced its return trip to the Azores. The *Aeolus* carried its usual crew of four, with Capt. Hans W. von Engel at the controls. After the engines had been started by compressed air and warmed up, the skipper of the plane opened the throttles wide and signalled the engineer stationed at the air valves that he was ready to go. When the air pressure was applied the 10-ton plane moved smoothly forward along the track, and with rapidly increasing speed passed over the stern of ship and into the air without losing as much as a foot of altitude. A roar from the engines, a hiss of air, and the plane was on its way. Such is the catapulting procedure for the flying boats – expensive perhaps, but highly efficient and the cost is being amply justified. On the return trip, the flying boats made very good time. The *Aeolus* left New York on September 22, and 17 hours and 47 minutes later it had landed at the Azores. It completed the 2,400 mile trip at an average speed of 135 mph. The *Zephir* also returned to the Azores by way of Bermuda. With persistent thoroughness, both the planes then returned to America to complete a survey northward to Halifax and Nova Scotia for additional fiight data. Now that this work is done, they will resume their duties on the South Atlantic, leaving the North Atlantic for the larger four-engined planes which are being rushed to completion for the air mail service which starts next year.

A Deutsche Lufthansa seaplane coming in for a landing.

ARCADE, NEW YORK

By JOSEPH BRESLOVE
Consulting Engineer

THE Village of Arcade, N. Y., has operated its own municipal electric plant and distribution system since 1909, also a municipal water system. It has been a successful venture since its inception and the village has benefited by the profits of the electric plant.

The plant not only furnishes electric power to the village, but to several outlying districts within a radius of 5 to 8 miles, respectively, Yorkshire, Delevan, Chaffee and some isolated sections within proximity of the distribution lines.

Of further interest is the fact that the power plant also furnishes steam for heating the downtown section, schools, etc. This is accomplished through the use of low pressure steam, obtained as exhaust from the steam engine generator unit in the power plant. With possibly two or three exceptions, the rate for steam for heating is the lowest in the United States—actually 60 cents per 1000 pounds. It serves about fifty customers.

The population of the village is about 1,600 with approximately 600 connected customers in the village and a total of 1,000 connections on the system.

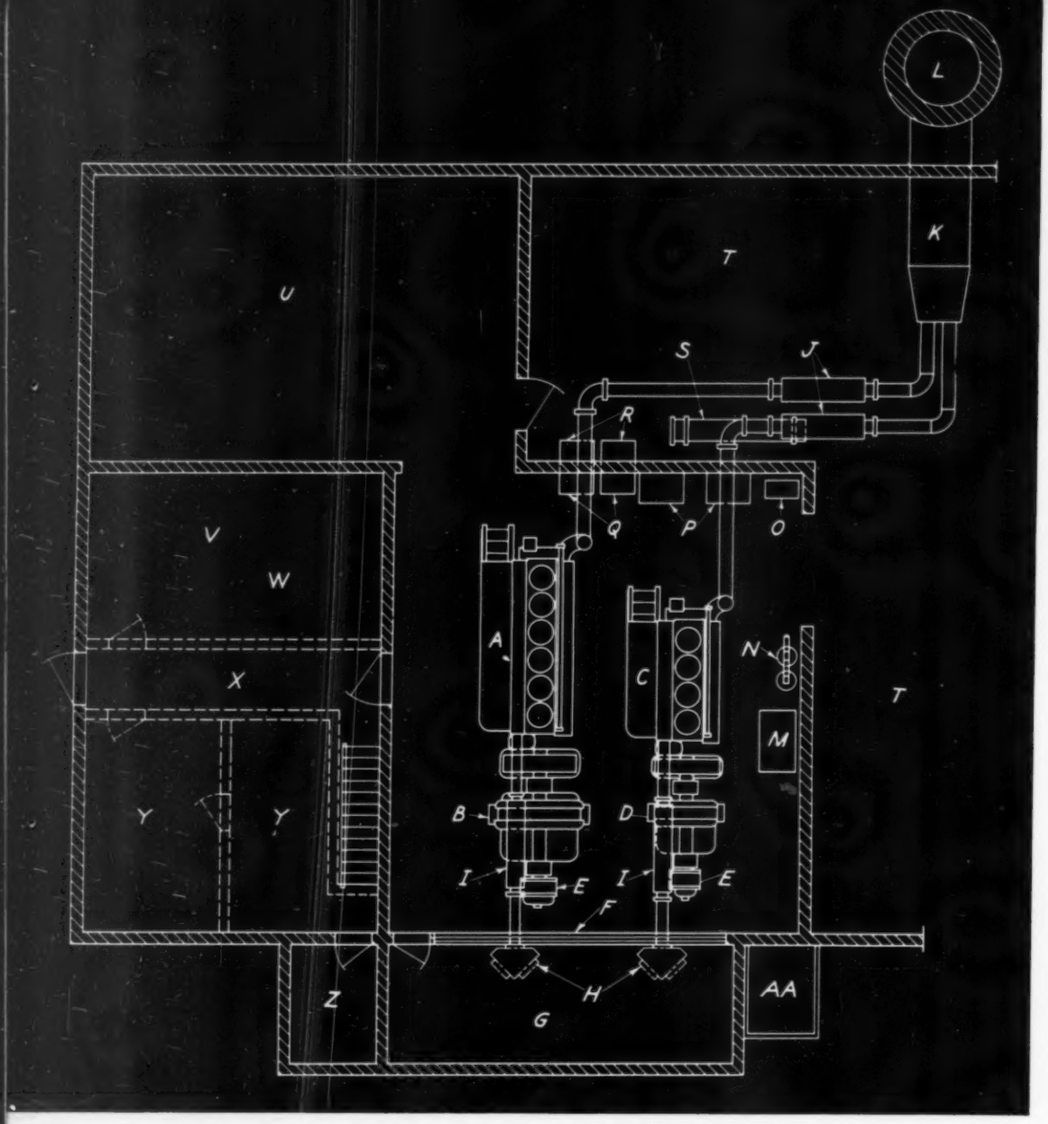
Like its contemporaries it started in a small way, with larger equipment added as the load increased. Until more recently power was generated by a 200 kw., 60 cycle, 2,400 volt generator direct-connected to a Skinner Uniflow Steam Engine, receiving steam from a modern water tube boiler installation served by a multiple retort stoker. The capacity of the generating system, however, was only sufficient for about one-half the demand, and additional power was purchased from the local Public Utility Corporation, the Niagara-Hudson Company. The electric generating system is 2-phase, it having inherited a number of 2-phase installations, and having started as such. Purchased power is 3-phase, with interchange through Scott Connected Transformers. Extensions to the system are 3-phase wherever possible. Both 2-phase and 3-phase power is distributed.

The total annual output of the system for the past few years has averaged 1,600,000 kw. hrs., approximately half being generated and half purchased. The daily load varies from 200 kw. to 400 kw. with the night and Sunday load between 125-150 kw. The village is fortunate in possessing a number of small industrial plants resulting in a fair day load.

The steam supplied for heating averages twelve million (12,000,000) pounds during a mild winter and rises to about sixteen million (16,000,000) pounds during a severe one. The heating season stretches over eight months, from September to April.

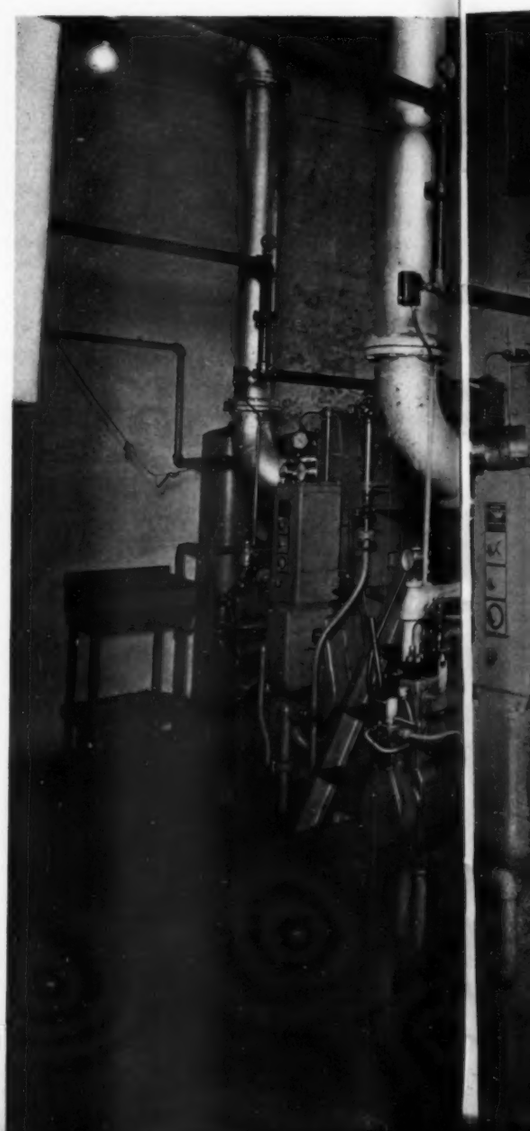
In common with other communities, the demand for electric power has been increasing at a rapid rate and the domestic load remarkably so, breaking all previous records. This brought the Arcade plant to a point where the question of additional capacity became one of importance. A survey was made to determine whether additional power should be purchased, or additional generating capacity installed, and if the latter, the type and size of equipment. Owing to the demands for heating steam, the steam plant must be kept in operation during the eight months heating system. This makes for very cheap electric power since it is almost a by-product up to the point where all the exhaust steam can be used to advantage for heating, the engine being operated non-condensing and exhausting into heating system.

Purchased power was obtained at a flat rate of 1.8 cents per kw. hour, with a guaranteed minimum charge per year. During the sum-



Legend

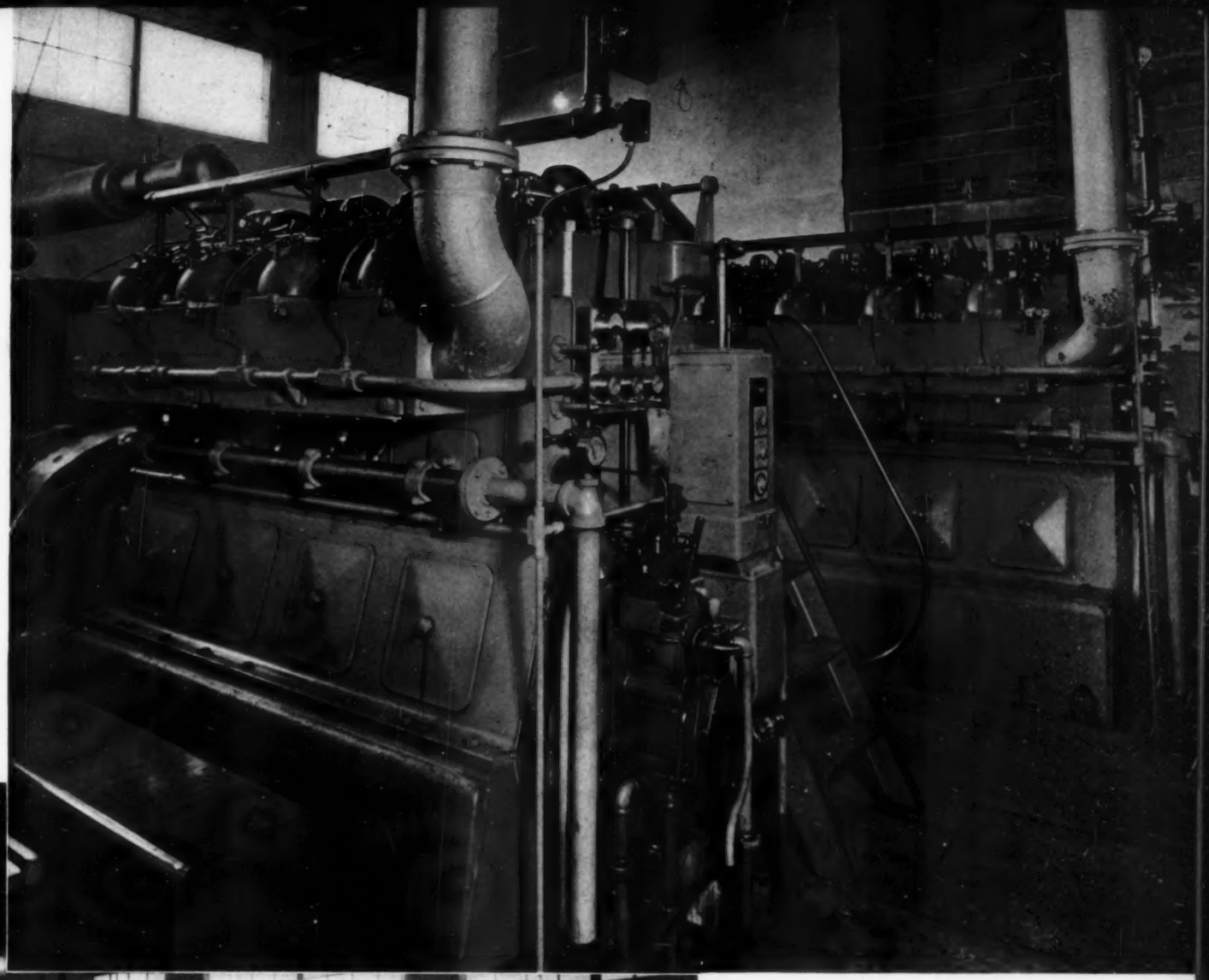
A	Six cylinder 500 hp. 360 rpm. Winton Diesel engine
B	350 kw. Westinghouse generator
C	Four cylinder 325 hp. 360 rpm. Winton Diesel engine
D	225 kw. Westinghouse generator
E	Exciter
F	G-E switchboard
G	Electrical equipment
H	Coppus filters or engine air intakes
I	Air intake mufflers
J	Burgess exhaust mufflers
K	Cylindrical stack breeching
L	Stack
M	Gardner-Denver starting air compressor
N	Starting air receivers
O	Hydroil lubricating oil centrifugal purifier
P	200 gallon lubricating oil tanks
Q	100 gallon fuel oil day tanks
R	100 gallon jacket cooling water service tanks
S	Ross jacket cooling water heat exchangers
T	Boiler room—steam unit
U	Engine room—steam unit
V	Storage room on second floor
W	Director's room on ground floor
X	Aisle on ground floor
Y	Offices on ground floor
Z	Vault
AA	Valve house

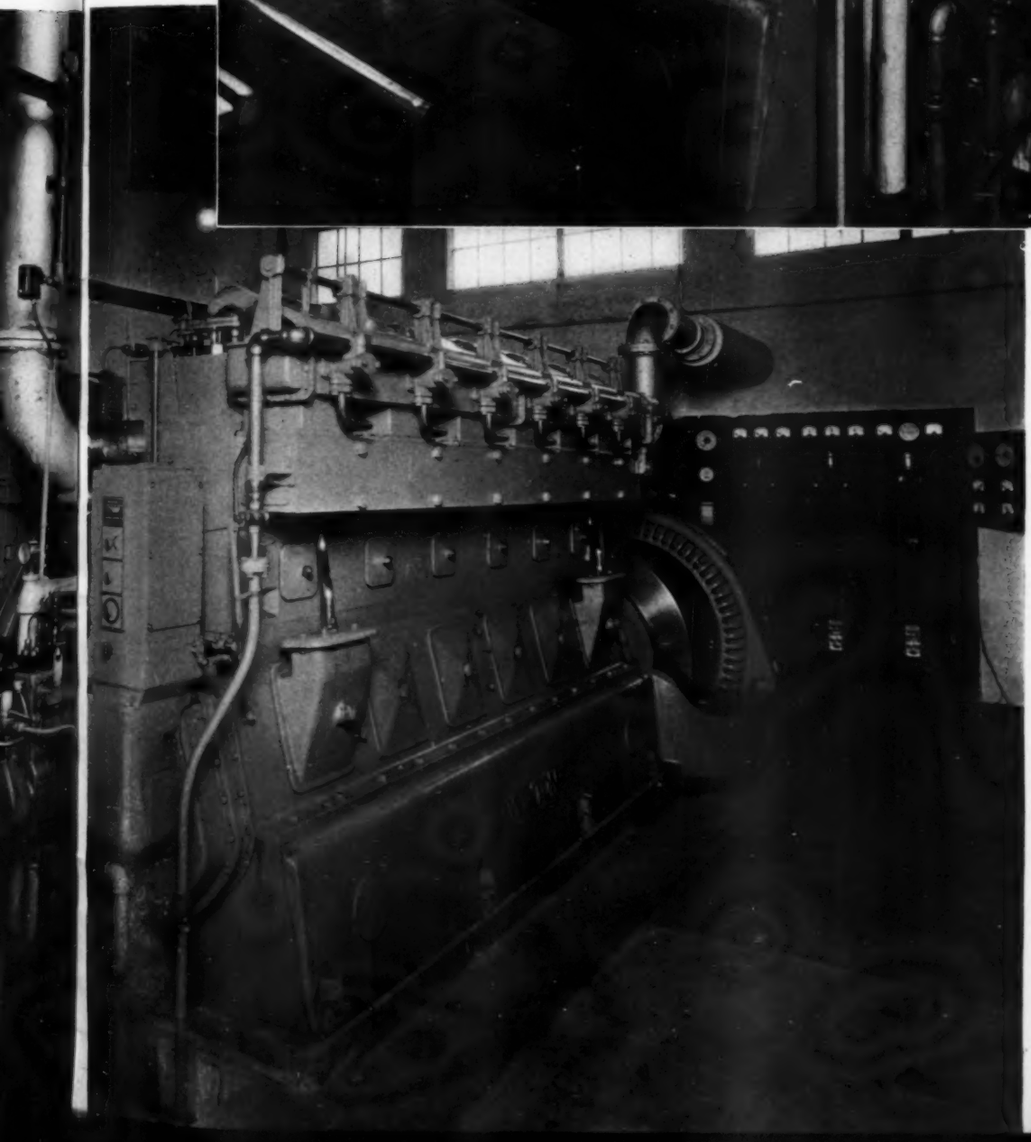


mer months a certain quantity of so-called "excess power" could sometimes be obtained at 1.7 cents per kw. hr. and the purchase of all power in excess of one million k.w.h. for any calendar year at 1.5 cents. At no time did the total exceed this quantity and for the years 1931-35 the cost averaged 1.65 cents. Coal delivered at the plant cost $4.22 per ton.

A study of this situation resulted in the recommendation of the installation of Diesel Engines. These fitted into the general scheme most advantageously. During the winter months the steam unit is operated carrying a load which results in the correct supply of low pressure exhaust steam for the heating system. The demand for electric power beyond this is generated in the Diesel units. During the summer months the steam plant is shut down completely and power is generated entirely by the Diesel units. During the early fall and late spring it may be found advantageous to operate the low pressure boiler in the plant to supply the comparatively small demand for heating steam, the Diesel Generators continuing to supply the electrical demand. The flexibility of the system cannot be excelled in this respect and it is expected that desirable "load factor" will be maintained.

It was desired to limit the building costs and to utilize the existing engine room so that one operator might handle the plant. This was accomplished by the removal of an obsolete steam unit, and the space thereby made available now houses two Winton 4-cycle Diesel Engine units, each direct coupled to a Westinghouse 2,400 volt 3 phase generator, with direct-connected exciters. The engines are rated at 350 kw. and 250 kw. respectively. The first is a six-cylinder 14″ x 16″, four cycle, 360 rpm. engine connected to a Westinghouse 350





kw. 80 per cent power factor generator. The other is a four-cylinder engine of the same type, cylinder dimensions and speed, connected to a Westinghouse 250 kw., 80 per cent power factor generator. The engines are equipped with Woodward hydraulic governors with electrical control for synchronizing and adjustment and Alnor pyrometers for measuring exhaust heat temperatures. Both of these units, with day service fuel tanks, lubricating oil tanks, Hydroil lubricating oil purifier, starting air tank and a Gardener-Denver compressor are installed in the same room, 32 ft. x 28 ft.

Ross heat interchangers, LeCourtenay circulating pumps, Burgess exhaust and intake silencers and Coppus air filters are installed adjacent to the engine room, so that one operator is in charge of the entire plant. A Binks water cooling tower is located outside the building.

. . . . *And now please turn to page 47*

LITTLE NOURMAHAL

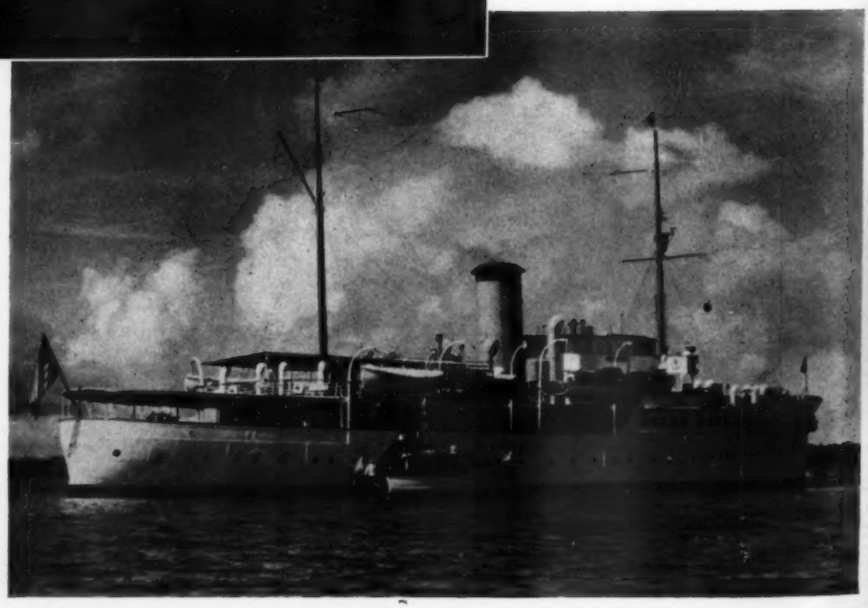
Latest Addition to the Bermuda Diesel Fleet

ONE of America's best known yachts is the *Nourmahal*, owned by Mr. Vincent Astor, a true skipper and blue water navigator. Like several of our prominent yachtsmen, Mr. Astor has contributed materially to the country's scientific knowledge by incorporating scientific research with pleasure cruising. The many voyages of the *Nourmahal* to the Galapagos Islands and adjacent waters and the remarkable specimens of plant and animal life brought back each time have been well described by numerous writers.

To facilitate cruising and fishing on the many bays, sounds and inlets of the Bermuda coast, Mr. Astor recently took delivery of the *Little Normahal*, a 42-foot Wheeler cruiser. This trim little craft has a beam of twelve feet six inches and a maximum draft of only three feet. She is powered with a pair of Buda Diesels of 110 hp. each at 2,150 rpm., giving her a speed of sixteen miles per hour. The Diesels are the regular Buda marine type with 4¼ inch bore and 5½ inch stroke and are connected directly to the 19 inch by 12 inch twin propellers. The boat itself follows the well known Wheeler lines and construction. She should be extremely satisfactory in the type of service which Mr. Astor contemplates.

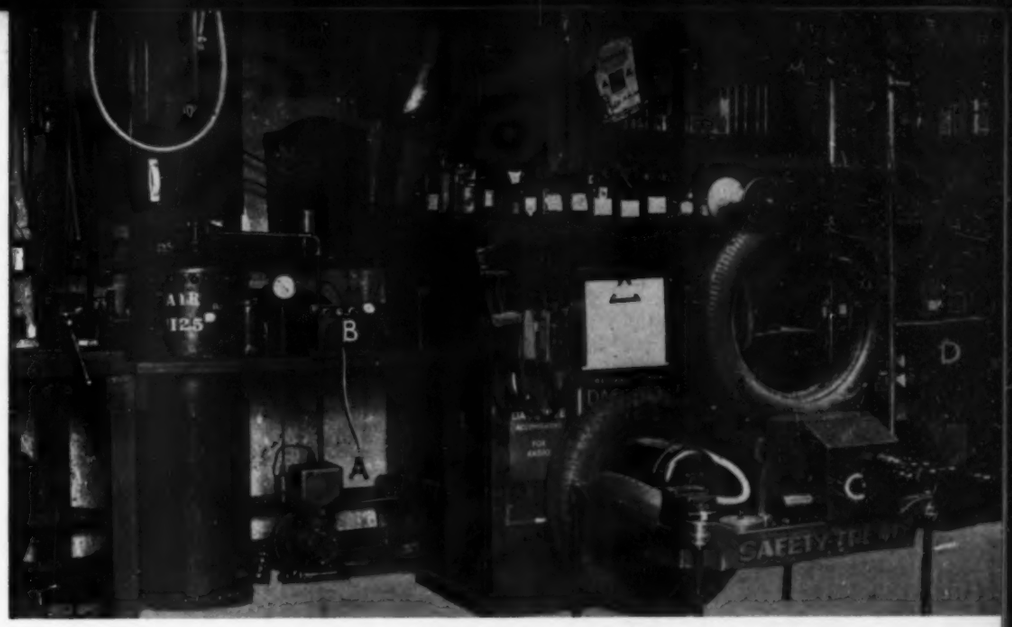
Photographs courtesy of the Bermuda Board of Trade.

Typical Bermuda scenes both afloat and ashore. Carriage roads cut from coral rock lead through twisted cedars, hybiscus and oleanders to "the bluest water in the world," where the two "Nourmahals" lie at anchor.



LONDON LETTER NO. 12

By GEORGE LIND



A corner of the workshop at the Staffordshire garage showing part of the equipment for which the National Diesel generates current: A — Compressor, B — Plug Tester, C — Tyre grooving machine and D — Charging Bench.

NOW-A-DAYS, one of the heaviest charges which the small garage owner has to meet is his electricity bill. Electrification of the workshops and brilliant lighting are mainly responsible for this. In the normal course of events, the proprietor tacitly accepts the position and plugs into the local power lines. Occasionally, however, he queries the Electricity Company's figures, investigates for himself, and makes the startling discovery that he can generate his own electricity with the help of an oil engine for very much less than the cost of mains current.

To better illustrate the point, here is an actual instance of a garage owner with a small service station in Staffordshire, who installed the necessary plant and almost halved his power and lighting costs as a result. Strangely enough, the property in question is within a stone's throw of the public supply generating station, and until a few years ago the proprietor, Mr. Magnier, used the supply company's electricity exclusively. In 1934, however, after the addition of a number of power-driven tools, he decided to look for cheaper ways of purchasing current, with the result that in June of that year he placed an order with the National Gas and Oil Engine Co., Ltd., of Ashton-under-Lyne, for one of their 11 hp. horizontal Diesel engines connected by a crossed belt drive to a 220 volt 19 amp. Laurence Scott generator.

For the greater part of two years this generating set has been working on an average for 14 hours per day, supplying current for power and lighting the whole premises, comprising the workshops, office, yard, look-ups, and filling station. During the whole of this time, the fuel consumption has averaged three to four gallons daily, and the lubricating oil consumption a bare 1¼ pints. In addition to the lighting requirements, power is used for the battery charger, sparking plug tester and cleaner, air compressor, paint spray gun, tyre pump, Tecalemit hydraulic lift, high pressure lubricating plant, tyre tread grooving machine, electric soldering irons, office fire and five electric petrol pumps.

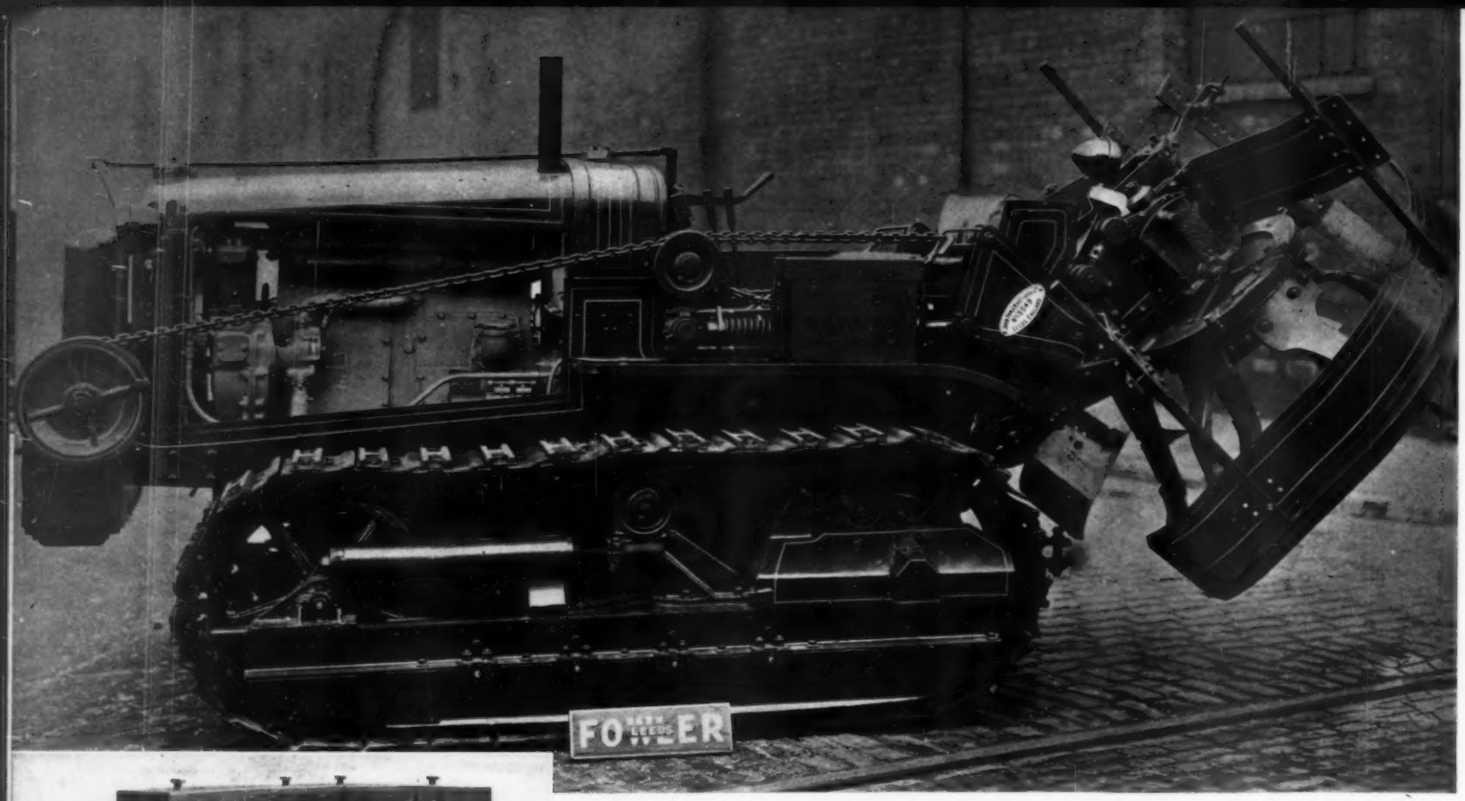
No special staff is employed to look after the generating set, and any adjustments that are found necessary, such as cleaning brushes and atomizer valves, can be conveniently carried out at times when work in the shops is at its lowest. The plant can easily handle all the items at one time and has given absolutely trouble-free service up to the present.

Generator end of Staffordshire garage Diesel-electric plant. The 11 hp. National Diesel is in the background, driving through a flat belt at 600 rpm.

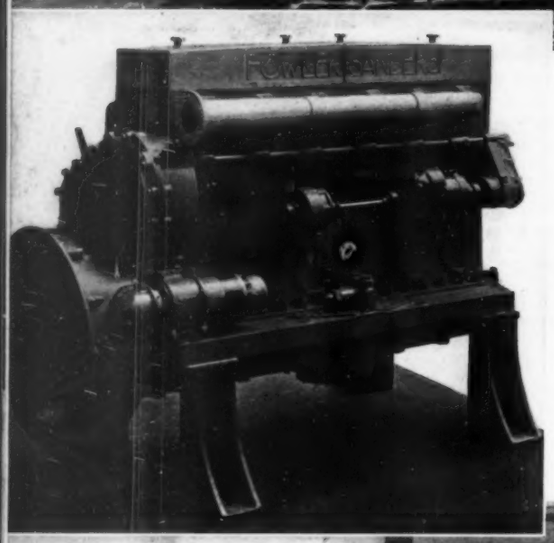
As regards the operating costs, the old figure for mains current was, approximately, £500 per annum. Now, after the alterations, the average expenditure on fuel and oil for the plant is £12 per month. Making due allowance for repairs, labor, interest and depreciation, the annual cost is about £300, thus giving a saving of some £200 per year.

On the following pages are two illustrations of our latest type of shunting locomotive, one showing the loco pulling a load of trucks, and the other of the engine. This machine is a particularly interesting job, as it can be used either for heavy shunting purposes or for hauling light trains on main line feeder routes. It is of the standard gauge 0-6-0 class, weighing some 46 tons in full running order, and has been built by the Vulcan Foundry, Ltd., of Newton-le-Willows, Lancashire.

The Diesel engine used as motive power is a standard 4-stroke, six-cylinder Vulcan-Frichs unit with a bore and stroke of 8.46 ins. and 11.02 ins. respectively. It is governed to a maximum of 775 rpm. when it develops 300 bhp. For the crankcase, a steel casting of sufficient size to provide a lubricating oil sump is used, the seven main bearings being carried in the same casting. The cylinder blocks are mounted separately and are fitted with inserted liners and detachable heads. Aluminium alloy pistons are used, the single inlet and exhaust valves being actuated by push-rods and rocker gear from a camshaft in the crankcase upper



One of the smaller Fowler Diesel Gyrotillers.



180 bhp. Fowler-Sanders Diesel used in the largest size of Fowler Gyrotiller. An integrally built fuel centrifuge is carried on the opposite side of the unit.

Aveling Barford present a new Diesel engined 2¼ ton roller.

half. Fuel is delivered by a small capacity feed pump to the two sets of injection pumps, which are controlled by a centrifugal governor. Should a defect occur in the lubricating oil system, causing a loss of pressure, a servo motor in the oil circuit is brought into action cutting off the fuel delivery to the injection pumps, and thus stopping the engine. A compressor is located at the front of the engine, and this supplies air at 450 lbs. per sq. in. for starting and also for the power brakes. There is tankage for 200 gallons of fuel and 50 gallons of lubricating oil, the latter being carried in a reservoir underneath the gearbox. The engine is cooled by means of a water cooler with fan, the fan having a Vee belt drive through counter-shafting from the camshaft. As the locomotive is operated in both directions, the cooler is arranged on the side of the vehicle, thus assuring equally effective cooling in either direction of running.

The main frames are formed by steel plates 1⅛ in. thick, located inside the wheels and well stayed together by built-up stretchers distributed throughout their length. The buffer beams are 1¼ in. thick and are connected to the frames by means of end stretchers. In addition, the engine bedplate, constructed of heavy plates and sections, adds appreciably to the frame strength.

Engine power is taken through a Vulcan-Sinclair hydraulic coupling to a five-speed Wilson epicyclic gearbox and thence to a David Brown

totally enclosed bevel reverse and final reduction gear unit. All three axles are coupled, the drive being transmitted through a jackshaft by means of connecting rods to the centre axle.

The controls, which are all conveniently situated within the cab, and are duplicated to assist manipulation, have been simplified to a surprising degree and consist only of a brake valve gear and engine throttle lever and reversing lever. On the instrument panel are ten dials registering speed, engine revolutions, flow of electricity, temperature of the exhaust gases, air brake pressure, starting air pressure, cooling water temperature, fuel pressure, lubricating oil presure, and air pressure for gearbox actuation.

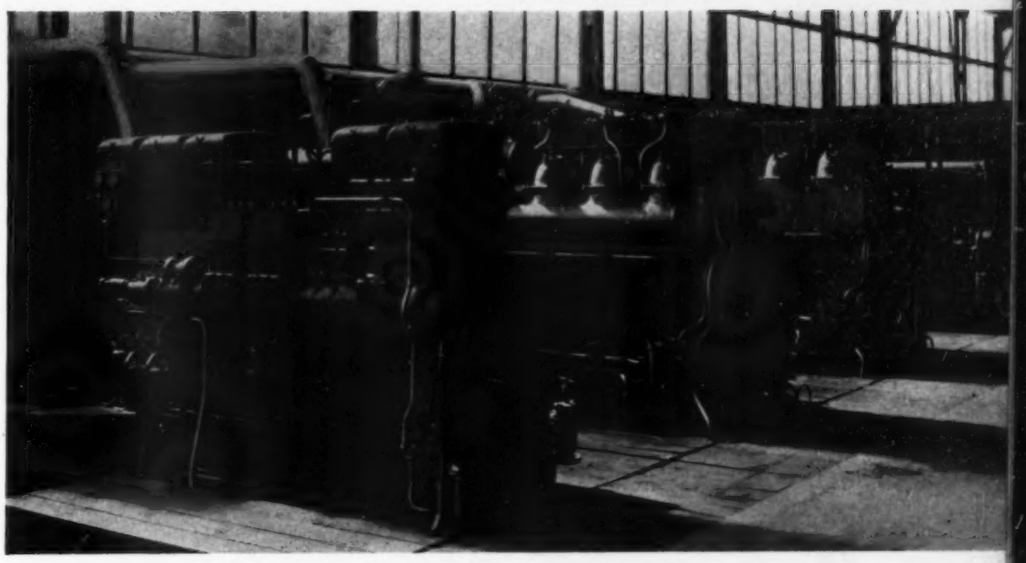
The gear-box provides speeds of 4.57, 11.4, 21.3, 32.6 and 46 mph., and the locomotive has a maximum tractive effort of 20,300 lbs. During tests carried out in the Vulcan yards the machine accelerated from rest to fourth gear in about 150 yards—a particularly creditable performance—and hauled a load of 1,090 tons on the level at 4.57 mph. Another noteworthy point was the engine's instant response to the controls, even under adverse conditions. The locomotive is at present undergoing extensive tests in the northern yards of the L.M.S.

At the Royal Agricultural Society's Show this year, Aveling-Barford exhibited for the first time a new range of road rollers of 2¼ to 3 tons weight. These very neat and workmanlike little machines are designed for path construction, light road work, and grass rolling, and since their introduction nearly 50 of them have been ordered. The engine, a two-cylinder, 4-stroke Diesel, developing 13¾ bhp. at the governed speed of 1,100 rpm., is of sturdy construction with all working parts entirely enclosed and dust-proof. It is extremely economical, using only 1 to 1¼ gallons of fuel per full working day, and is arranged for cold starting by hand.

A useful extra for this roller is a special drawbar for hauling a triple mower. This combination of roller and mower enables the two operations—cutting and rolling—to be performed simultaneously, and is, undoubtedly, the best way of keeping large areas of grass in first class condition.

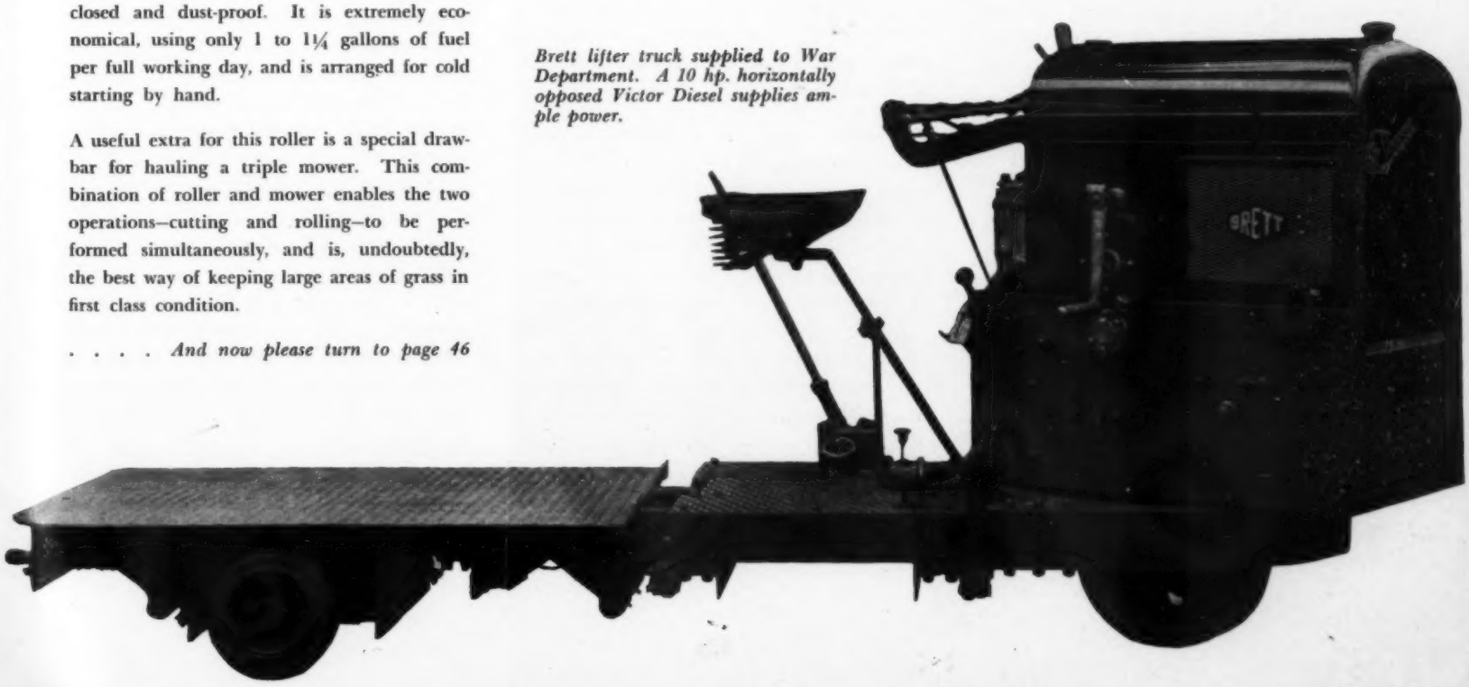
. . . . *And now please turn to page 46*

One of the 300 hp. Vulcan-Frichs shunting locomotives hauling a load of trucks in the Vulcan yard.



Frichs traction type oil engines on the test bed. In the foreground a 6-cylinder 300 hp. unit similar to that in the above locomotive.

Brett lifter truck supplied to War Department. A 10 hp. horizontally opposed Victor Diesel supplies ample power.



DIESEL TRAWLER, STORM

By FRED MURKLAND, *Forty Fathom Fisheries*

BOSTON – The "American Cycle" in the fishing industry began here when the trawler *Storm,* first of three built by the Forty Fathom Fisheries of Boston, made her trial trip out of Boston Harbor. The *Swell* and the *Surf* have followed, the total cost of all being $600,000. Each, for sanitary reasons, has its fish holds lined with pure nickel.

The three trawlers are American, from stem to stern, inside and out. To begin with they are of strictly American design, a radical departure from the British designed trawlers which have remained unchanged for nearly 30 years.

Hitherto, American ideas have not been an important factor in fishing equipment. The Grimsby trawler of English design has been the vessel accepted by the fishing industry all over the world. Until these new Forty Fathom trawlers, the substitution of Diesel power for steam was the only contribution by the American fishing industry toward advancement of fishing methods.

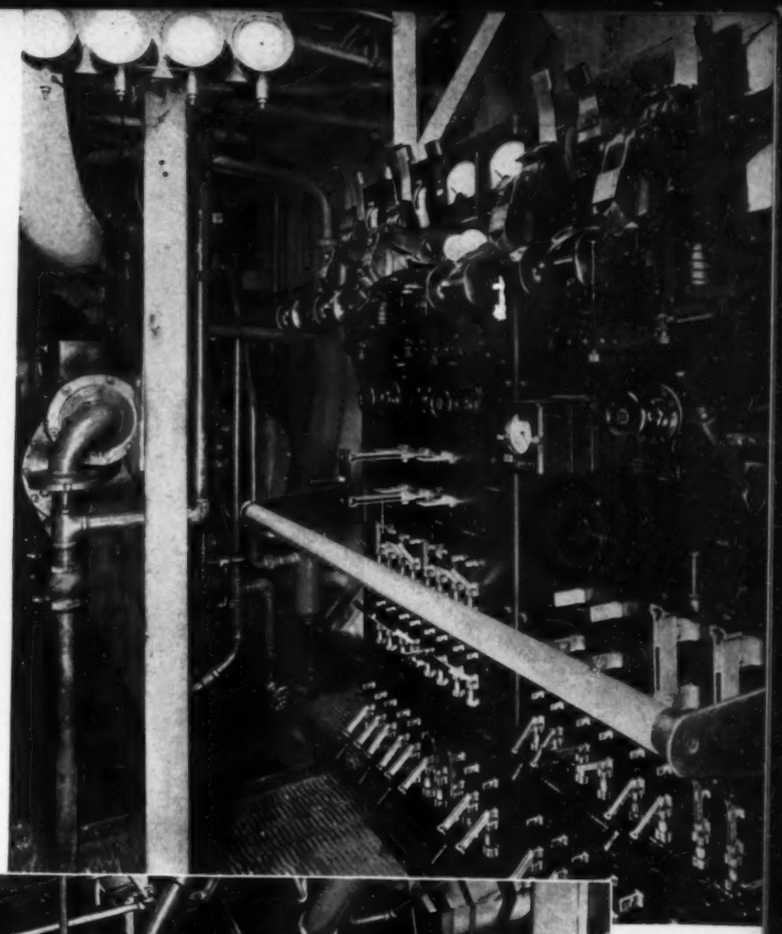
Into the construction of the three new Forty Fathom trawlers has gone years of American planning by engineers and officers of Forty Fathom Fisheries.

Streamlining, larger power, advanced electrical equipment, improved quarters for officers and crews, shower baths for all hands – and that's something that IS new – drying rooms for wet clothing, and, particularly the Nickel-lined refrigerated fish holds which assure "winter fish in summer," are some of the features of American construction. Moreover, they were built by American workmen, in an American shipyard, of American materials. To make them truly all-American, the champagne spilled down their bows is a native product. (Recently an English company launched a new trawler. With the exception of power, it was identical in design to the first trawler built by the Forty Fathom Fisheries in 1905.) The new trawlers are so constructed as to be more easily driven through heavy seas in bad weather, and so as not to be "down by the head" when returning, loaded, from the banks. They will permit longer fishing in bad weather, greater comfort for the men, and quicker runs to the market.

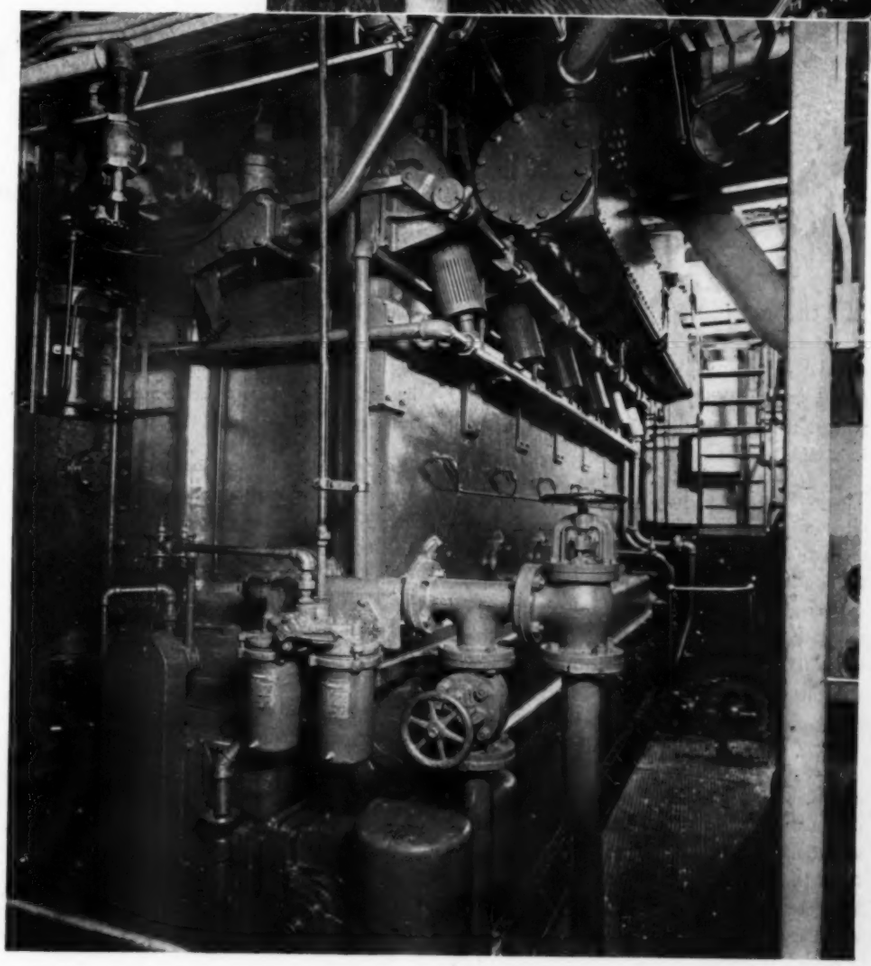
It was Yankee ingenuity, spurred by continued losses in production through varying climatic conditions, which resulted in development of the longest step in the fishing industry in the world for more than a quarter of a century – the refrigerated hold. Pride in having built the first exclusively all-American trawlers is doubled by the fact that newly designed, refrigerated holds lined with nickel, will result in almost an absolute elimination of second and lower grade fish, caused by temperature changes.

The new trawlers are 144 feet, 8½ inches long over all, and 131 feet on the waterline; have beams of 25 feet and are 13½ feet deep. The hulls, riveted, are of unusually heavy construction. Plates have been increased above the present standard practice requirement as much as 50 per cent. The steel is twice as heavy as that used in U. S. Navy cruisers. The hulls are so designed that there are no rivets in any of the tanks, and the section forward of the fish-hold bulkhead, decks, deckhouses and other inside steel work is all welded. The stems have a pronounced forward rake with the lines immediately aft the stem unusually fine to permit easy entrance into the water. The underwater lines aft are of cruiser stern type. The quarter decks are enclosed with rounded steel deckhouses, providing protection against seas breaking aboard, also serving as storage space for deck gear. The rounded lines of these deckhouses, extending down to the conventional cruiser sterns, give a decided streamline appearance. As to the quarters: The radio room is on the main deck abaft the galley. The captain's stateroom is behind the pilot house and contains a large berth, lockers, chart board, etc. Other officers' quarters are aft, below main decks, with separate rooms for chief engineer, mate, assistant engineer. There are also guest rooms. The rooms are provided with single berths, seats, lockers, etc., with washrooms in adjacent passageways.

The crews' quarters are forward in the forecastles, with the entrances through trunks, or sheltered entrances, on the main decks. These trunks are of sufficient size to contain washrooms, and drying rooms where the fishermen may leave wet clothing to be dried instead of taking it into the forecastles. Each forecastle is equipped with 12 single berths — the present trawler has 12 individual lockers, seats, table and stove. The engine rooms are of ample size to give good working space and are heated with the modern unit type heater which will also serve for ventilation and cooling in the summer time. The main engines are 17½-inch bore by 25-inch stroke, heavy-duty solid injection McIntosh & Seymour Diesels, capable of developing 600 hp. and 180 rpm. Electric power is provided by a 30-kilowatt generator driven directly from the flywheel of the main engine, large enough to furnish power for all purposes while the main engine is running. For use in port a 25-kilowatt auxiliary driven by a Hill engine is installed. The trawl winch unit is a special design by General Electric engineers. The usual radio and fathometer, or depth-measuring devices are aboard. The *Storm* marks a new trend in trawler design and engineering.



General Electric furnished this compact and complete control panel. Below: End view of the McIntosh & Seymour Diesel. Prominent in the foreground are the Nugent lubricating oil filters. A Maxim exhaust silencer is carried in the stack.



THE CRUISE OF THE ISLANDER

By CLIFFORD GESSLER

Member of the ship's company of the "Islander" on her first South Sea Cruise.

HONOLULU, Hawaii. — Back from a voyage of two months on her second trip to far corners of the South Seas, the motorship *Islander,* Capt. William G. Anderson, has been refitted to augment the fishing fleet of America's mid-Pacific territory.

The performance of the *Islander,* the only vessel from this part of the United States that has cruised among the Tuamotu, the Austral Islands, Rapa, Pitcairn and other remote places in waters generally held to be dangerous of navigation, indicates the effectiveness of this type of boat, powered with Diesel motors, for voyaging in those seas.

The *Islander* is a modified sampan, an adaptation of a type of boat built in Honolulu and extensively used for commercial fishing. It is designed for high power, speed, seaworthiness and shallow draft. These qualifications caused the *Islander* to be selected for the important Mangarevan expedition of the Bishop Museum, which required a vessel capable of going from island to island independent of winds and currents, taking shelter behind reefs in threatening weather, and riding out storms that would be highly dangerous to craft not having these features.

The *Islander* is 87 feet long and draws 7 feet. She is powered with a 200 hp. Atlas Diesel. Her economic cruising speed has been figured at 8.9 knots, but she can do up to 10 or 12.

She was built by the Honolulu Iron Works, as a fishing boat, and altered slightly in the spring of 1934 for the scientific expedition. A superstructure was added, with quarters for the captain and mate forward, accommodations aft for the scientists of the expedition, and a galley between. A drying house for botanical specimens, since removed, was added aft of the starboard side of the scientists' quarters. Building of this superstructure necessitated raising the bow, to continue the original lines of the craft. As an added improvement, "baffle boards" were installed on the sides to reduce the wash and battering of waves. Certain modifications were also made in the stern. The museum trip demonstrated the seaworthiness and maneuvering power of the boat. Waterfront sages shook their heads when the alterations were being made. "She'll never float," they said. "She'll tip over when wind or sea hits the side." These gloomy predictions never had a sign of fulfillment. It should be added that the superstructure is light and has little influence on the stability of the boat, which is ballasted by its heavy engine. The *Islander,* so remodeled, is like no other boat in the territory and probably unique in the United States. Her first trip in her new form gave her an extended experience which would have been a severe test for any craft of her size.

The *Islander* left Honolulu April 16, 1934, and returned October 28, 1934, having voyaged more than 9,000 miles and visited 31 islands and many atolls and reefs, from the Line Islands to lonely Pitcairn, refuge of the *Bounty* mutineers, in the extreme southeast of Poly-

nesia, and Rapa in the south, where the cold begins. The Tuamotu, the Mangareva islands, the Australs, and all islands of the Society group were among the more important places visited, and the cruise included such out of the way spots as the uninhabited Henderson island, Oeno, and Maria.

A crew of four can operate the ship, but at times the company aboard, including scientists shipped technically as "crew," and native pilots taken aboard at Papeete, numbered as many as fifteen.

The voyage, like any venture of that scope and duration, had its incidents. On an April night in the lagoon of Fanning Island, a squall blew up while most of the ship's company were ashore; the *Islander* dragged anchor and drifted toward the lagoon entrance on the four knot current, in imminent peril of piling up on the reef. Fortunately a land line, passed around a cocoanut tree, held and swung the boat shoreward, fetching her up on a sandbar near a stone sea wall in front of the property of Fanning Island, Ltd., a copra station.

Blasts of the whistle summoned the members of the expedition, who dashed through the wind-tossed cocoanut grove in a blinding rain, lit by broad sheets of lightning and, heedless of possible sharks, waded and swam to the ship.

That scene lives in the writer's memory as a confused medley of flashing lights, thud of bare feet on wet decks, chill of wind through drenched clothes, hauling on lines and shouted commands in English, Hawaiian, Tahitian and Gilbertese. The power of the Atlas Diesel, with skillful seamanship by Capt. Anderson and the help of Hugh Grieg of the Fanning company and his stout Gilbert Island lads, swung the ship back into deep water, where an extra anchor held her steady until the departure for Tahiti.

Scenes like this native house embowered in tropical foliage, with the stupendous pinnacles of the Moorea mountains towering in the background, greeted the American ship's company of the "Islander," whose trusty 200 hp. Atlas Diesel saw them safely through seven months' voyaging.

Three weeks later, in the Tuamotu, quick action, shallow draft and the Diesel again saved the *Islander* from destruction. She had left the atoll of Anaa and was heading for Napuka and Tepoto, in the night. The Tuamotus, in sailing days, well earned their name of the "Dangerous Islands." Low lying, some of them without even trees to mark them, and most of them visible even in daylight for only five miles or so, surrounded by reefs, imperfectly charted, and beset with changing currents, they are still a graveyard of ships. While the *Islander* was in those waters, half a dozen schooners, two cutters and the only steamship in those seas were lost.

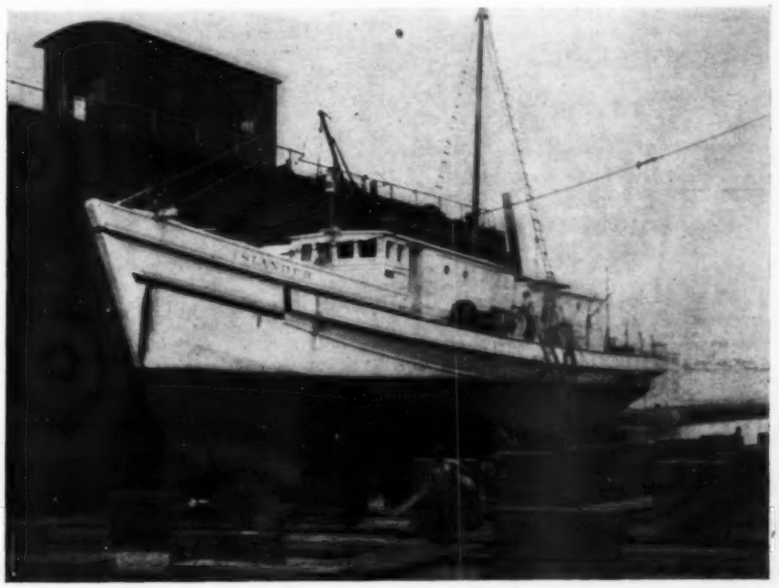
The route led between two of these low islands. Suddenly the man at the wheel felt that something wasn't just right, and in a moment the surf stared at him ahead. The engine was reversed, and with a mighty wrench pulled the ship back just in time to avoid piling up on the reef of Tahanea.

In the lagoon at Hao, another Tuamotu atoll, where the tide rushes in and out of a thirty-mile lagoon at an even greater sped than at Fanning, the crew had another bad four hours in a bit of rough weather, but successfully avoided major damage.

At Rapa the ship caught fire from an oil lamp in the botanical drying house. Again, prompt action extinguished the blaze before it reached the gasoline that was carried as fuel for the outboard motor boats. Some of this gasoline was carried out, at considerable hazard, by the chief botanist of the expedition, listed on the ship's papers as "bos'n's mate."

Heavy seas between Henderson and Pitcairn proved the *Islander's* ability to take punishment in the open. The ship arrived at Papeete from the south in August, somewhat battered, but sound. The drying house roof and walls were charred; the heavy timber across the bow, used in hoisting anchor by hand, had been

. . . . *And now please turn to page 53*



The good ship "Islander" in dry dock where her decidedly unique underbody lines are visible.

LONDON LETTER

. . . . *Continued from page 41* . . . .

Transporter trucks are used extensively now-a-days for internal factory cartage. Hitherto, most of them have been powered with petrol engines, owing to their low first cost. Nevertheless, there are certain factories in which fire risks must be very carefully avoided, and in such places the petrol engine is quite unsuitable. To bridge the gap, therefore, the Brett Patent Lifter Co., Ltd., of Coventry, have produced a handy lifter truck powered with a Diesel engine.

The first of these vehicles has just been supplied to the War Department. Its motive power is a 1,000 c.c. Victor two-cylinder, horizontally opposed, water-cooled, four-stroke engine governed to 2,000 rpm. It is started by hand and needs no heating auxiliaries. The engine drives through a clutch and gearbox, giving two forward speeds and one reverse, the maximum being 10 mph. The tractive efforts on the two gears are 395 lbs. and 652 lbs. The engine complete with all parts, gearbox, clutches, etc., is mounted on roller bearings, which work inside phosphor bronze housings. The truck can be turned in a complete circle.

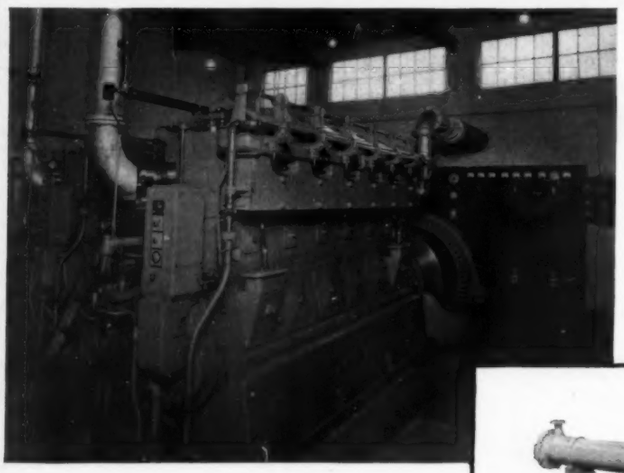
One of the most rapidly expanding Diesel markets is agriculture. So say Messrs. John Fowler, of Leeds, at any rate. And Fowlers ought to know what they are talking about, considering that they are one of the largest manufacturers of agricultural machinery in this country.

•

To keep pace with the requirements of their machinery designers, their Diesel expert, Mr. A. Freeman Sanders, has devloped a new type of engine. The feature of this unit is the new form of air-cell combustion (known as two-way swirl) employed. The area of the throat connecting the air cell and the combustion chamber proper is of very much greater area than is usual with a spheroidal air-cell. The object of the design is to reduce heat losses and wire-drawing, besides simplifying the cylinder head casting. The injector is arranged horizontally in the side of the swirl chamber. By reason of the considerable width of and length of the communicating passage between the air cell and combustion chamber the air rotation changes from anti-clockwise to clockwise towards the top of the piston's stroke. At the point of change, when the air-cell air is quiescent, injection occurs. Mr. Sanders considers this to be the important point about his design.

From the accompanying illustration the clean, straightforward external appearance of the Fowler-Sanders unit will be noted. Everything that could possibly be enclosed has been, accessibility being retained by the use of quickly detachable inspection covers. Nowhere are any fragile oil pipes visible.

Three sizes of the new engine are, at present, being manufactured. The largest, a six-cylinder unit of 180 to 200 bhp., is suitable for all the firm's heaviest machines, as, for example, the biggest Gyrotillers. These large and expensive contraptions are usually owned and operated in this country by contractors, who lease them out to the farmers. In the colonies, however, land owners with vast tracts of property often own their own machines. Normally, the machine commences tilling early on the Monday morning, and by utilizing three shifts of drivers, runs almost continuously until Saturday night. That the engines are able to stand up to such usage is a fine tribute to their design and construction.

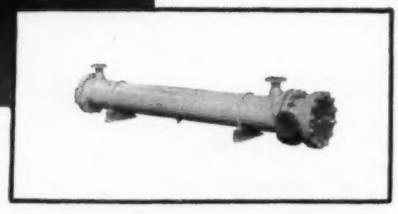


ROSS

LUBE OIL—JACKET WATER COOLERS

SELECTED BY WINTON ENGINE CORP. FOR THE NEW MUNICIPAL PLANT ARCADE, N. Y.

ONE OF MANY INSTALLATIONS BY LEADING DIESEL MANUFACTURERS WHERE ROSS COOLERS HAVE BEEN USED. CONSIDER



- DESIGN
- PERFORMANCE
- APPEARANCE
- RELIABILITY

ARCADE, N. Y.

ROSS HEATER & MFG. CO., INC.

DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORP.

NEW YORK, N. Y. 1407 West Avenue, Buffalo, N. Y. CHICAGO, ILL.

ARCADE, N. Y.

. . . . *Continued from page 37* . . . .

A complete new General Electric switchboard, with remote control, was also installed at this time; so that the resulting plant is modern and represents the latest engineering practice. A number of innovations making for safety, economy of operation, and space, are incorporated in the design and it is hoped to describe these in a later issue.

This plant has been in operation only a short time and complete operating records are not yet available, but with fuel oil at 5.25 cents per gallon and lubricating oil at 51 cents per gallon, power is being generated at a cost of 0.5 cents per kwh. for fuel and lubricating oil only. The load factor on the Diesel units varies from 55 per cent to 64 per cent. Indications are that the estimate of savings over that which would have been obtained had purchased power been continued, will be substantiated or exceeded, and will permit all fixed and operating charges and complete amortization of the bonds in about twelve years.

The combination of steam and Diesel generation at this plant is ideal, both from the standpoint of economy and facility of expansion with increase of load.

The trustees of the village have given considerable of their time and effort in carrying out this project and are to be congratulated on the ownership of a profitable venture which has resulted in a low power and heating rate and other advantages to the village. These officers are:

D. C. Bentley, Mayor;

W. S. Davis, Trustee;

R. I. Cartwright, Trustee;

N. C. Saxton, Clerk and Superintendent of Power.

SATURNIA

. . . . *Continued from page 27* . . . .

sport facilities have been improved on the top deck, where the openings of the dancing hall have been abolished. The dancing hall on the promenade deck has had its decorations and its furniture renewed. The old style has been replaced by a happy combination of modern style with a predominance of light green and gold colors.

On the verandah deck after it has been arranged a large promenade deck for the tourist class with an open air swimming pool, bar and gymnasium. The entrance halls on the main deck have been enlarged in size and renewed in decorations. The main feature of such renewals consists particularly in the fact that the purser offices, which used to be on the verandah deck, have been transferred in the entrance halls in order to facilitate the passengers when arriving on board.

The most important work carried out to the passenger accommodation of the M.S. *Saturnia* is without doubt the reconstruction of the aft part of the main deck where a set of tastefully decorated public rooms at the disposal of tourist class passengers has been arranged. The verandah starts such set immediately after the steer gearing house.

On deck C and on deck D the number of cabins has been reduced in order to enlarge their size so that tourist class passengers have at their disposal accommodation which is more comfortable than in the past.

The rebuilt *Saturnia*, as her sister ship, the M.S. *Vulcania*, can carry now 1,300 passengers instead of 1,700 passengers as in the past.

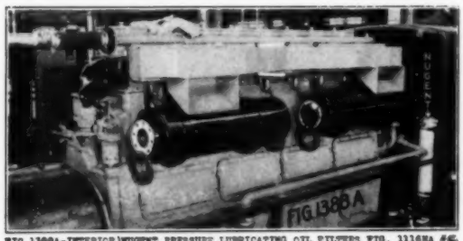


FIG.1388A-INTERIOR VIEW OF W.W.NUGENT & CO. CHICAGO, ILL. OCT. 10, 1934 | NUGENT PRESSURE LUBRICATING OIL FILTERS FIG. 1116HA #4L INSTALLED ON EACH OF TEN DIESEL ELECTRIC 600 H.P. SWITCHING LOCOMOTIVES FOR THE N.Y.,N.H. & HARTFORD R.R. FIVE POWERED WITH COOPER-BESSEMER DIESELS AND FIVE WITH INGERSOLL-RAND DIESELS.

AGAIN! 20 NUGENT PRESSURE OIL FILTERS HAVE BEEN CHOSEN

FIG.1388-EXTERIOR VIEW OF W.W.NUGENT & CO. CHICAGO, ILL. OCT. 10, 1934 | NUGENT PRESSURE LUBRICATING OIL FILTERS FIG. 1116HA #4L INSTALLED ON EACH OF TEN DIESEL ELECTRIC 600 H.P. SWITCHING LOCOMOTIVES FOR THE N.Y.,N.H. & HARTFORD R.R. FIVE POWERED WITH COOPER-BESSEMER DIESELS AND FIVE WITH INGERSOLL-RAND DIESELS.

For the 10 New York, New Haven and Hartford Railroad Locomotives . Five Ingersoll-Rand and Five Cooper-Bessemer 600 hp. Each Diesel Electric Engines

— WHY? —

***BECAUSE*—Each of these filters has 3780 square inches of filtering surface (patented) and occupies a room space of only 2040 cubic in.**

***BECAUSE*—They filter *all* the oil in circulation and produce 99 8/10% clean oil.**

***BECAUSE*—After years of actual practical test they have proven to be the most effective and economical oil filters on the market.**

10 Major Railways in United States and Canada and All Except One (and That One Has Wired for Prices) of the Large Diesel Engine Builders Have Adopted Nugent Lubricating and Fuel Oil Filters as Standard Equipment

39 YEARS' EXPERIENCE BUILDING OIL FILTERS SHOULD HAVE ITS REWARD

See Nugent Filter in Right Hand Corner of Cut Fig. 1388A **YOU TAKE NO *CHANCES* DEALING WITH *NUGENT***

Send for Bulletin 7A or Complete 200 Page Catalog of Our Full Line

WM. W. NUGENT & COMPANY, Inc.

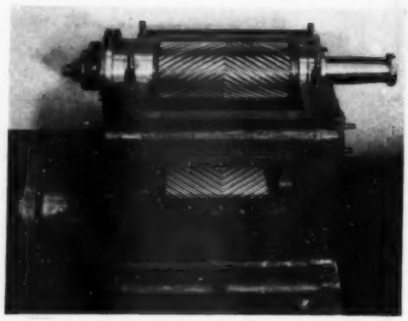
417 N. HERMITAGE AVE., CHICAGO, ILLINOIS

Established 1897

FARREL TESTS NEW MARINE GEARS

ANSONIA, Connecticut, October 8, 1936. — It was our pleasure to witness a most interesting preliminary test of the Farrel-Birmingham reduction gears for the new tug, *Paul Card* now nearing completion at the Russell-Erie Basin Shipyard.

The gears were designed to deliver 720 hp. at 120 rpm. Despite the facts that they were motor-driven up to 900 rpm., that they carried no load and that the lubricating oil was much lighter than that used in regular service, the test was notable for absence of vibration and noise. By means of temporary glass cover plates, it was possible to observe the thorough and complete action of the force-lubricating system which is standard equipment on all Farrel units of this type. The effectiveness of this system is most important when a Diesel-Geared tug bites into a heavy tow and buries her stern, thus materially increasing the declination of the gear case which would otherwise drain all lubricating oil into the stern end. A further interesting feature of the gear assembly is the self-contained, tapered, double-roller thrust bearings.



Starboard side of gear case with top housing and cover plates removed.

The Diesel engine which will soon drive the new Card Towing Company's tug through this Farrel gear is a McIntosh & Seymour high speed, standard locomotive type of 8 cylinders, 12½ inches by 13 inches. It delivers 720 hp. at 600 rpm. which, with the 5 to 1 gear reduction, gives a propeller speed of 120 rpm. Thus, by means of gear drive, both the engine and propeller can operate at most efficient speed. In addition this type of drive materially reduces the weight and size per horsepower of the prime mover, a most important consideration for marine work.

The design of the *Paul Card* was executed by Gielow, Inc., Naval Architects. She measures 100 feet by 24 feet by 12 feet, 6 inches. It is expected that her launching will take place on or about November fifteenth and approximately thirty days more will be required to complete her for actual service. Operating in the New York Harbor vicinity, this Diesel-Geared tug will be watched with a great deal of interest by marine men. She will have plenty to show them.

The same Farrel gear ready for installation.

Diamond triple-strand one-inch pitch Roller Chain Drive used on Cooper-Bessemer engine

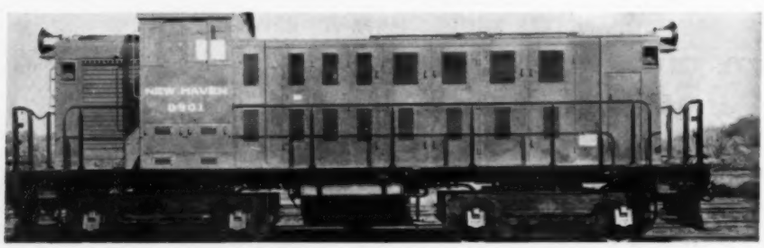
TRADE ◇ MARK

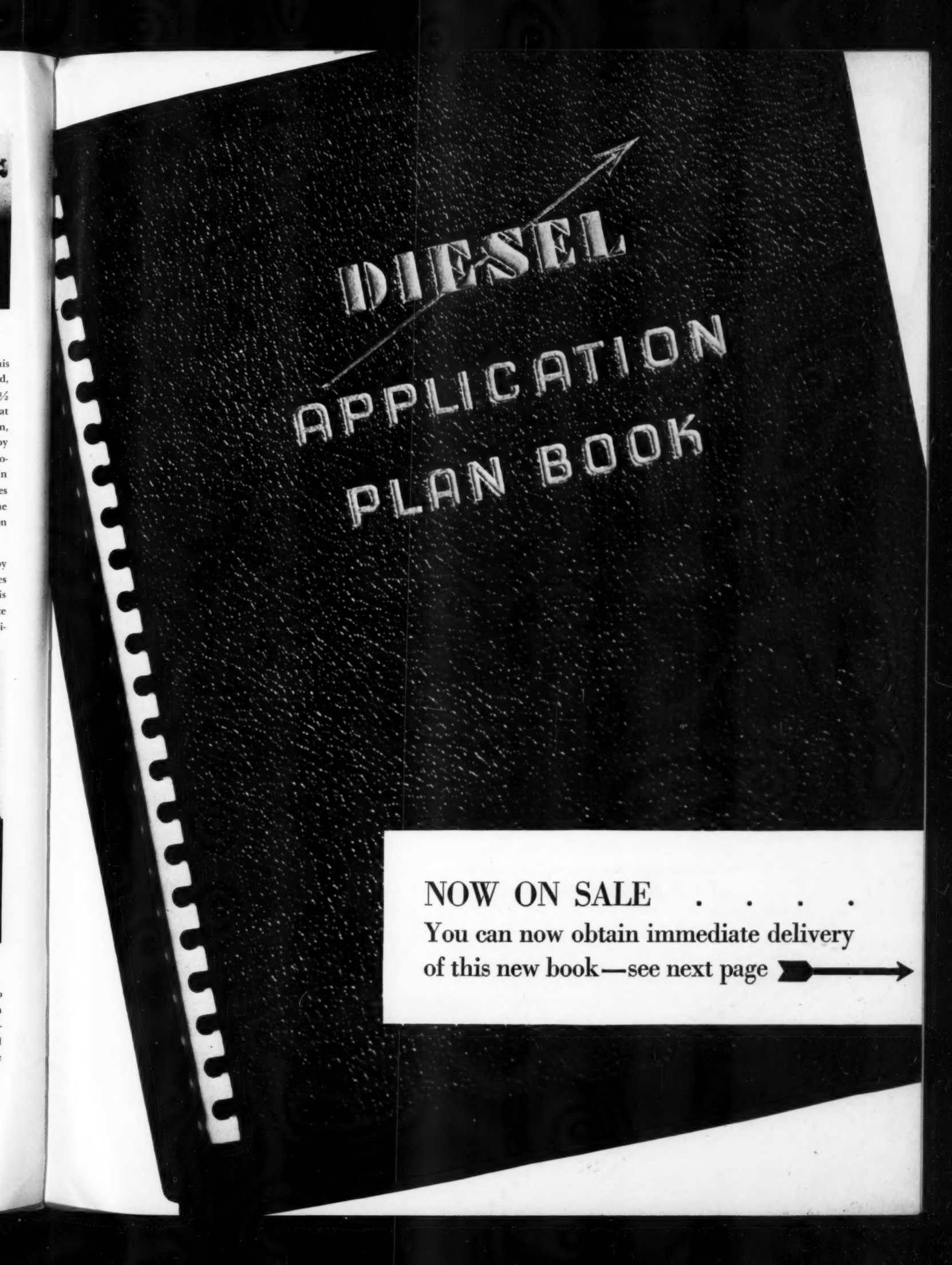
Working on the Railroad

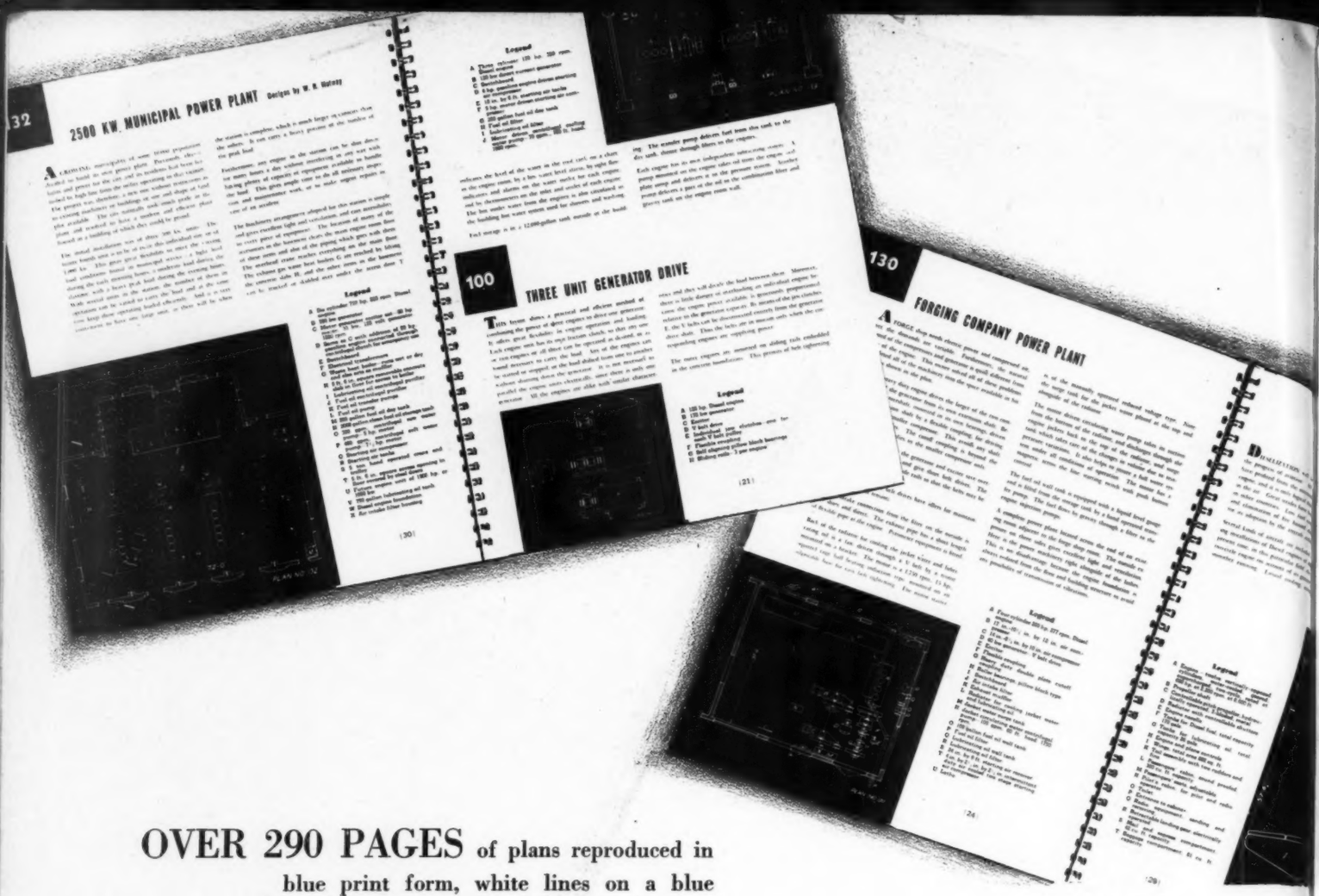
For the New Haven Railroad locomotives the Cooper-Bessemer Diesels selected are equipped with Diamond Drives—timing and auxiliary drives with 10 years of service on engines of leading Diesel builders. . . . In railroad service their long trouble-free life, split-second accuracy, quietness, and high efficiency insure maximum engine operating performance. . . .

DIAMOND CHAIN & MFG. CO.,
407 Kentucky Ave., Indianapolis, Ind.
Offices and Distributors in Principal Cities

DIAMOND DIESEL DRIVES




DIESEL
APPLICATION
PLAN BOOK
NOW ON SALE . . . .
You can now obtain immediate delivery
of this new book—see next page



OVER 290 PAGES of plans reproduced in blue print form, white lines on a blue background, of Diesel Applications. Every conceivable type of Diesel application. Over 300 illustrations. Forty-seven Consulting Engineers and nineteen engine companies contributed to the editorial content.

The practical experience of an entire industry, gathered together in book form, and placed at your disposal in the hope you will be helped, that you will be informed and that you will be convinced of the availability of the Diesel engine for your purpose.

In these two hundred and ninety-eight pages you will find industrial, marine, transportation and aviation applications of the Diesel engine, all in blue print form. It is our hope to provide in this book at least one plan, one application, which will approximate YOUR power requirements, so that you may vizualize how easily and efficiently a Diesel application may be worked out to solve your own specific problem.

Sign, Tear Off and Mail Coupon NOW

DIESEL ENGINES, INC., Two West Forty-Fifth Street, New York, N. Y.
I enclose Five Dollars, ship me postpaid one copy of DIESEL APPLICATION PLAN BOOK, it being understood I may return book (in good condition) within ten days of its receipt for full credit if I don't like it.

Name _____

Address _____

(Please Print)

$5.00

Trim size 9" x 12" • 298 pages • Plastic spiral binding • Over 300 illustrations • Ten-day return privilege if book doesn't measure up to expectations.

DIESEL COUPLED ALTERNATORS FOR LIGHTING PLANT SERVICE

By B. J. VON BONGART

As is well known, the piston speed of heavy duty Diesel engines varies from 600 to 1,200 ft. per minute; a piston speed of 900 ft. per minute is universally considered sound practice. A speed of but 600 ft. per minute is wasteful in that the engine is not being used to capacity; a speed of 1,200 ft. per minute may well be considered excessively high in that lubrication difficulties are more than likely to occur.

Since the stroke of the engine influences the piston speed, the optimum rpm. of the crankshaft may readily be determined. Heavy duty engines permit a crankshaft speed of from 90 to perhaps 500 rpm., depending upon the size of the engine. Aside from the piston speed (in ft. per minute) the permissible rpm. of the crankshaft are dependent upon the weight (mass) of the reciprocating parts – weight of the pistons, wrist pins and perhaps 40 per cent of the weight of the connecting rods – and the weight of the rotating parts – 60 per cent of the weight of the connecting rods plus the weight of the crank throws.* The weight of the reciprocating and rotating parts limit definitely the engine's permissible speed.

In addition to the foregoing, the periods of vibration (inherent in every engine) caused by movements of the reciprocating and rotating masses, determine the engine's speed, so that every designer chooses a crankshaft speed about midway between two distinct periods of vibration. The average engine may have three or four (or more) distinct periods of vibration.

When a Diesel engine is directly coupled to an alternator (not belt or gear driven) definite engine speeds must be maintained so that the alternator may generate electricity at the customary frequencies of 60 or 25 cycles. This necessitates in some instances the adoption of a slower speed or even a higher speed than the engine is intended to run at.

To understand this, we must have a clear conception of the working principles of an A.C. generator. The fundamental essentials of any generator consist of an armature and a field. The laymen may visualize an armature as revolving (the very name seems to indicate this) and the field as stationary. However, such a construction is employed only in connection with small alternators. The larger generators usually have a revolving field and a stationary armature. A typical alternator is shown in Fig. 1.

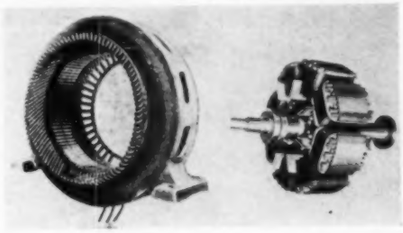


Fig. 1. Eight-pole, three-phase alternator.

This seemingly unorthodox arrangement is customary for all of the larger generators. It is beyond the scope of this article to delve too deeply into matters electrical, so let it suffice to say that there are sound technical as well as practical reasons for the adoption of this arrangement (Fig. 1).

In order to generate either 60 or 25 cycle current (or any other frequency for that matter), the alternator must possess a definite number of (field) poles for a given rotative speed of the said field. The poles must be in pairs, N and S. A four-pole revolving field (stationary armature) is shown schematically in Fig. 2.

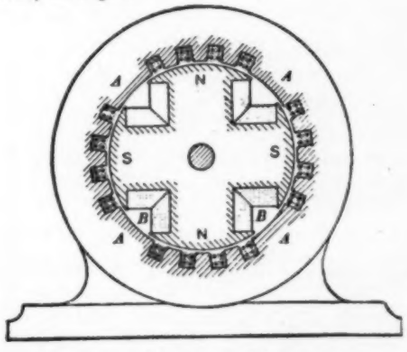


Fig. 2. Four-pole field, A.C. generator.

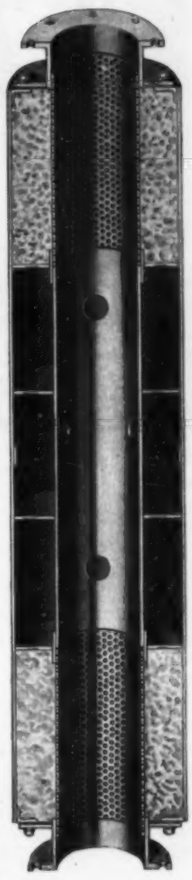
The field coils (pole pieces) revolving with the shaft to which they are attached, are excited by means of D.C. current, which is usually obtained by coupling a small D.C. generator directly (or belt or gear driven) to the shaft of the alternator.

The pole requirements of an alternator gen-

. . . . *And now please turn to page 54*

*The figures given, i.e., 40 per cent of the weight of the connecting rod as reciprocating and 60 per cent of its weight as rotating, are not mathematically accurate, but are sufficiently so for all practical purposes.

INDUSTRIAL SILENCING



● The Burgess CA Series Silencers represent the most efficient noise reduction devices for large Diesel air intakes, compressors, and the exhaust of vacuum pumps. The straight-through construction, high frequency absorption, and low frequency acoustic surge chambers assure maximum silencing with the minimum restriction. Investigate Burgess Acoustic Devices for every problem of noise reduction!

Send for data and prices

Burgess Battery Co., Acoustic Div.
1025 E. Washington Ave.
Madison, Wis.

BURGESS ACOUSTIC
AIR CLEANERS AND SILENCERS, BREATHER CAPS, MUFFLERS, ENGINE HOODS, FAB TREATMENT, AND ACOUSTIC TILE LINING
LICENSED UNDER C. F. BURGESS LABORATORIES, INC., PATENTS

• You lose time and money every minute a truck is off the job . . . every minute *any* mechanic is laid up for repairs or servicing. The trick is to get them OUT . . . *quick!*

No trick at all when your machines are equipped with Snap-on —Blue-Point tools. Take the Snap-on Heavy Duty Boxocket Wrench, for example. The double-hex, thin-wall interchangeable sockets (from 15/16" to 3½" openings . . . 23 sizes in all), with either straight or offset heads (or both), in tubular handles up to 42 inches long . . .grab hold of nuts with a bull-dog grip, work fast, powerfully, safely!

"Keep Going with Snap-on" is more and more becoming a delay-reducing, profit-making servicing policy among operators who watch small details. The 120-page Snap-on catalog, listing more than 1600 tools for servicing every type of equipment, is worth sending for.

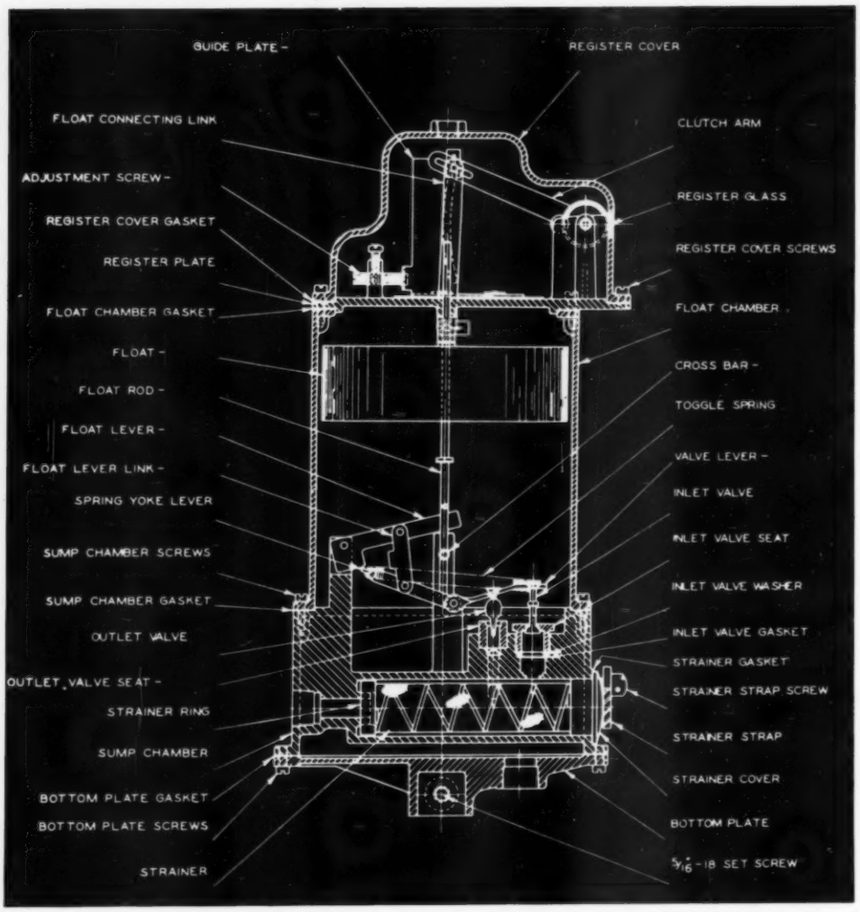
Snap-on Tools
INCORPORATED
Kenosha, Wisconsin
35 SERVICE-STOCK WAREHOUSES

free Catalog—Over 1600 Tools

Snap-on Tools, Inc., Kenosha, Wis.
Without obligation
☐ Send free catalog. Interested in .....
☐ Have representative call and demonstrate.
Firm .....
Address .....
..... DP

A NATIONAL TOOL SERVICE — DIRECT TO YOU

Snap-on Socket Wrenches
Blue-Point Mechanic Tools



A NEW FUEL OIL METER

THE cross-section illustration above of the Vesta Fuel Oil Meter shows a simple but effective, rugged but accurate, unit which surely will find ready acceptance in the Diesel industry. Every operating engineer knows the difficulties attendant to measuring the relatively small flow of fuel oil to a Diesel engine in order to check economy of operation.

The basic theory of the Vesta meter, which employs the principle of positive displacement through a float, is especially adaptable to recording accurately the hour by hour passage of fuel to the Diesel. In fact the actual range of satisfactory performance runs from as low as one tenth of a gallon to fourteen gallons per hour with a head of eight inches. Accuracy tolerances are less than three cubic inches to five gallons. While this meter is approved for use with No. 1 to No. 4 fuel oils inclusive, heavier oils may be handled if they are preheated. In the case of measuring Bunker oil flow with intermittent shut-down, it is necessary to jacket the meter to insure proper flow. This, however, is to be expected and would present no serious objection in view of the results obtainable.

The materials used in the construction of this interesting unit are corrosion resistant. The body is die cast zinc alloy, while the interior parts are formed of stainless steel, phosphor bronze, and brass, cadmium plated. The very important strainer is No. 60 mesh brass screen having an area of over four square inches and is quickly and easily removable for cleaning. The Veeder-Root counter runs up to 9999 9/10 gallons and then repeats. It cannot be turned back.

The meter is twelve inches high, five inches in diameter and weighs nine pounds. Where gravity flow is used, it is installed between the main storage tank and the day-tank. Otherwise, it is placed between the auxiliary pump and the day-tank. All in all, this is a very accurate and convenient check by the hour, day or month of Diesel engine fuel consumption and of operating economy.

ISLANDER

. . . . *Continued from page 45* . . . .

broken off short; the iron on the bow had been twisted off; the keel was dented where it had bumped a coral head at Managareva. But in all essentials she was as good as when she left Honolulu.

Two months later, after cruising through the Society and Line Islands, she brought everybody safely home to Honolulu, with 15,000 sheets of plants, 40,000 insects, 160,000 land shells, a representative series of other animals, and a large quantity of ethnological data in the form of recordings of native chants, specimens of native arts and handicrafts and data from the more primitive islands.

March 14, 1935, the *Islander* set out again, visiting Fanning, Christmas, Vostok, Tahiti, Rapa, Rurutu, Raiatea, Tahaa, Borabora and Penrhyn, and returned to Honolulu May 11, bringing stone implements from Rapa for the Bishop Museum and a tapa log from Rurutu, twenty feet long, said to be the largest specimen of that nature ever obtained. It was on these logs that the natives formerly beat the bark of certain trees and shrubs to make a fabric which they used for clothing before the white man introduced cotton cloth. "One of the most interesting incidents of this trip was the landing at Vostok, which is very seldom visited," said Capt. Anderson. "Vostok is a weird place. It is heavily wooded, so that the interior is always dark. We saw only two kinds of plants – the puka or Pisonia tree, and a creeping vine. The place is inhabited only by birds. "Fishing was good. We lived on fish when we were in the vicinity of islands."

The *Islander* is going back to fishing, for which she was originally designed. But her timbers recall the feel of the seas far the other side of the Line; they have been bathed with the phosphorescent ghost-fire of strange bays, and have ridden in the waters of coral-circled lagoons. The bare, hard feet of primitive tribes have trodden her decks, and on occasion the nimble toes of dancing girls, to the thud of the guitar or the rhythmic clash of hand-clapping.

And it would surprise nobody who has made the voyage with him if "Captain Bill" at any time should tire of the run between Honolulu and Fanning, and point the high sharp nose of the *Islander* south again, to the hundred islands that lure where the Southern Cross blooms like a flower on the stalk over those southern seas.

FOR CONSULTING ENGINEERS AND DIESEL ENGINE USERS

D · E · M · A ·

presents the new

"STANDARD PRACTICES"

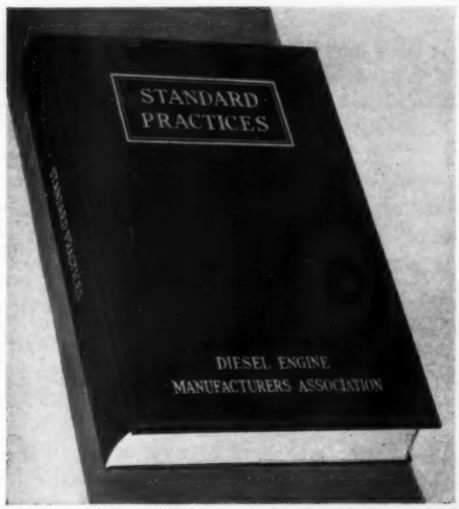
A Diesel Engineering Handbook written by Diesel Engineers for Diesel Engine Users **$2.00**

THE engineer especially and the Diesel user, also, cannot feel that he knows all about other phases of the Diesel industry unless the new issue of the D.E.M.A. "STANDARD PRACTICES" is also on his desk.

The DIESEL ENGINE MANUFACTURERS ASSOCIATION presents "STANDARD PRACTICES" to help users and consulting engineers to bring their Diesel background up to date, so that they will be able to deal with Diesel power as efficiently as they have dealt with steam and gasoline machinery in the past. It supersedes the 1930 "Standards of the Diesel Engine Manufacturers' Association" in more extensive form (see list of contents).

The rapid introduction of the Diesel to new industries and new applications, to people who have had little or no experience with Diesel power, has increased the need for clearer understanding of the true functions of buyer and seller. "STANDARD PRACTICES" explains clearly what the buyer should expect in terms of equipment and operating characteristics from the Diesel he buys or plans to buy.

"STANDARD PRACTICES" presents the standard practices of the industry, the economics of Diesel power, forms for bids and specifications, and a standard field test code, in addition to other valuable chapters. 180 pages, $2.00 per copy. Coupon below for your convenience in ordering.



Contents

Chapter I—Standard Performances, Equipment and Definitions.
Chapter II—The Cost of Diesel Power.
Chapter III—The Selection of Engine Sizes for a Given Load.
Chapter IV—Diesel Power-Plant Buildings.
Chapter V—Diesel-Engine Construction.
Chapter VI—Governors and Speed Regulation.
Chapter VII—Erection of Diesel Engines.
Chapter VIII—Fuel-Oil Storage and Handling Systems.
Chapter IX—Lubricating Oil Systems.
Chapter X—Cooling Water Systems.
Chapter XI—Intake and Exhaust Systems, Including Heat-Recovery Apparatus.
Chapter XII—Generators and Electrical Equipment.
Chapter XIII—Torsional Vibration and Critical Speeds.
Chapter XIV—Suggestions Covering the Preparation of Invitations for Bids and Detailed Specifications.
Chapter XV—Field-Test Code.

SIGN and mail the attached coupon, attaching remittance for two dollars for each copy desired. We extend you the privilege of returning this book to us, in good condition, within ten days of its receipt if it proves unsatisfactory to you.

DIESEL ENGINES, INC.
2 WEST 45TH STREET, NEW YORK, N. Y.

Enclosed find $2.00 for a copy of the D.E.M.A. Handbook entitled "STANDARD PRACTICES".

Name .....

Address .....

(Please print name and address)

DIESEL ALTERNATORS

. . . . *Continued from page 51* . . . .

erating 60 cycle current at different shaft (field) speeds in rpm., are computed in the chart, Fig. 3.

No. of poles	2	4	6	8
Shaft rpm.	3,600	1,800	1,200	900
No. of poles	10	12	16	18
Shaft rpm.	720	600	450	400
No. of poles	20	24	30	32
Shaft rpm.	360	300	240	225
No. of poles	36	40	48	50
Shaft rpm.	200	180	150	144
No. of poles	60	64	72	80
Shaft rpm.	120	112.5	100	90
No. of poles	90	96	100	120
Shaft rpm.	80	75	72	60

Fig. 3. Field-poles vs. shaft speeds, 60 cycles.

From the above chart we see that a two-pole alternator would require a Diesel engine turning at 3,600 rpm. Few of the Diesels in existence are capable of such a speed; hence two-pole alternators needs not be considered in the generation of 60 cycle current. A four-pole alternator, on the other hand, may be driven by a Diesel at 1,800 rpm. This is high-speed performance except for light six cylinder Diesel engines of perhaps 100 hp, or thereabouts, which are capable of driving a small generator of say 75 kva. output. For the larger Diesel engines such a speed would be impossible. While it is true that high-speed motors cost less to build than heavier slow speed engines — and this applies to alternators, too, for continuous service the slow speed engine and alternator possess definite advantages over the light high speed ones.

Poles	2	4	6	8	10
Rpm.	1,500	750	500	375	300
Poles	12	16	20	24	28
Rpm.	250	187.5	150	125	107
Poles	32	36	40	48	50
Rpm.	93.75	83.33	75	62.5	60

Fig. 4. Field-poles vs. shaft speeds, 25 cycles.

For the generating of 25 cycle current, the crankshaft-speed requirements of the driving Diesel engine are similar to the foregoing, except that different speeds have to be maintained. Low frequencies demand an alternator of fewer pole pieces or the generator may be driven at a lower rpm. And conversely, high frequencies call for a larger number of field-poles or increased generator rpm. The (shaft) speed requirements for a 25 cycle alternator are computed in chart, Fig. 4.

It is plain that for 25 cycle operation, a two-pole alternator could be used, the speed required being 1,500 rpm. However, in most of the Diesel engine installations for the generating of electric current, engine speed (and hence generator speeds) of from 90 to 500 rpm. are customary. Speeds of less than 90 rpm. would be used only in immensely large installations, and even in this case, the preferred practice is to use two medium size power plants

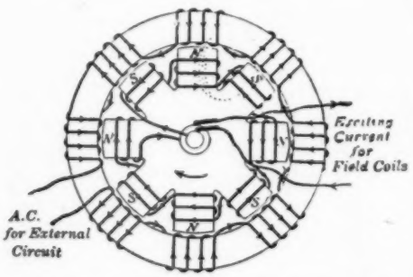
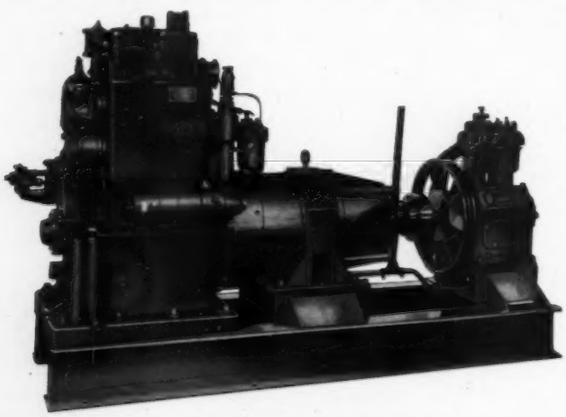


Fig. 5. Schematic diagram of single phase alternator.

"NO GASOLINE ABOARD"



QUICKLY PAID FOR THROUGH DIRECT SAVINGS

Utmost dependability is insured by this starting, charging and lighting combination—A Model GV Quincy Compressor, 800 RPM, displacement 20 CFM; an Ideal Electric & Mfg. Co. single bearing, drip-proof, 125 volt, 7½ KW, 800 RPM Generator; and a fuel-saving two cylinder 4¾ x 6½ Atlas Imperial Diesel, Model-2AS115 with electric starter.

—means lower insurance rates

AGAIN Quincy points the way to substantial savings. The minute you place a final taboo on taking gasoline aboard by installing one of these Diesel Driven Generator and Compressor Sets, for starting the main Diesel and for charging and lighting, you realize a double advantage. You increase your safety factor and you reduce your insurance costs surprisingly.

Do a bit of checking. Compare your present insurance costs with the lower rates you'll command when you can say, "No gasoline aboard." You'll be pleasantly surprised. It's one more way in which Quincy Compressors offer longer and better service plus larger operating returns.

Write us for complete details about this safety-promoting, money-saving development.

QUINCY FEATURES • TIMKEN TAPERED ROLLER BEARINGS • SEMI-STEEL PISTONS • DROP-FORGED CRANKSHAFT • NON-BREAKABLE STEEL VALVE • PERFECT CIRCLE PISTON RINGS • LYNITE CONNECTING RODS • FULL PRESSURE LUBRICATION • IMPROVED COOLING • NICKEL CHROME CASTINGS • TOTALLY ENCLOSED CRANKCASE.

QUINCY COMPRESSOR COMPANY, QUINCY ILLINOIS

QUINCY Compressors

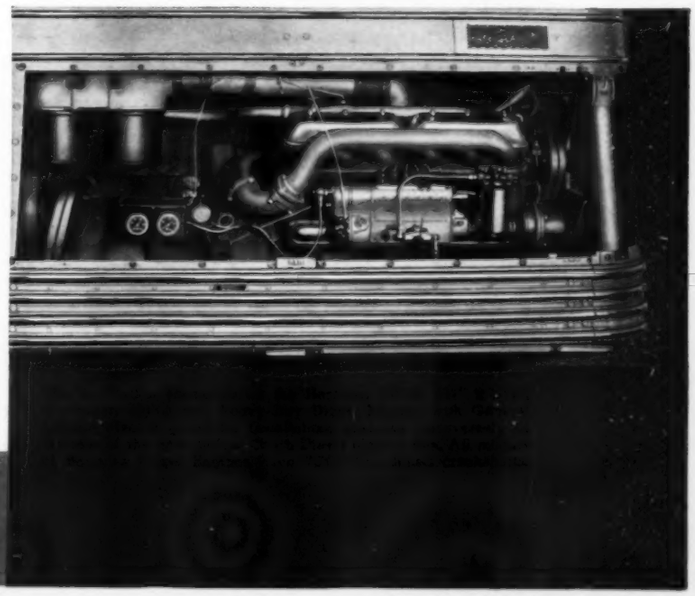
YELLOW COACH USES TOCCO-HARDENED CRANKSHAFTS

The new 36-passenger Diesel electric Yellow Coach, equipped with Hercules Diesel Engine and electric drive. The crankshafts of all Hercules Diesel Engines are TOCCO-hardened. A large fleet of these modern and efficient new buses is being built by the General Motors Truck Corporation for Public Service Coordinated Transport of New Jersey.

THE General Motors Truck Corporation of Pontiac, Michigan, is the world's largest bus manufacturer. Hercules Motors Corporation of Canton, Ohio, is the world's largest independent builder of heavy-duty engines. Public Service Coordinated Transport of New Jersey is the world's largest local bus operator. The aim of all three companies has been to develop the most efficient and advanced unit of passenger transportation – combining improved riding comfort and safety with lowered operating costs. They all agree that the TOCCO-hardened journals in the Diesels will materially increase the periods between necessary bearing adjustments, will lower maintenance expense and lengthen the life of the engines.

The General Motors Truck Corporation has been using the TOCCO PROCESS to harden the crankshaft journals of their own model 450 gasoline engines for a year. Other leading manufacturers who after long, comparative tests have already adopted the TOCCO PROCESS include the Autocar Company, the Cummins Engine Company, the International Harvester Company, the Packard Motor Car Company, the Waukesha Motor Company and the White Motor Company.

The TOCCO PROCESS of surface hardening by electrical induction produces an exact result. Shafts can now be hardened quickly at small cost and *at the bearing points only*—to 58-60 "C" scale Rockwell hardness (600 Brinell). This permits harder bearing metals and longer-lived engines. The net result is reduced maintenance cost and elimination of excessive oil consumption—important factors in all heavy duty operations.



TOCCO-HARDENED CRANKSHAFTS CUT OPERATING COSTS

Operators of large fleets of trucks and buses are reporting remarkable savings in maintenance expense on all vehicles powered by engines with TOCCO-hardened shafts. Truck and engine builders, using the new patented TOCCO PROCESS, say the following reports from their customers are typical:

"100,000 miles without a bearing adjustment!"

"Oil pressure gauge reading has not dropped at all in 80,000 miles, indicating *no* crankshaft wear."

"Oil consumption same as a new engine after 75,000 miles, due to original bearing clearances and perfect condition of TOCCO-hardened crankshaft journals."

"Former mileage period before regrinding crankshafts increased four times."

"Maintenance of 'new engine' rate of oil throw-off from crankshaft eliminates increasing carbon and piston ring troubles—which usually develop as crankshaft wears out-of-round or undersize."

"Permissible engine operating speeds stepped up ten to twenty per cent by use of harder bearing metals on TOCCO-hardened crankshafts without danger of pounding out or burning out connecting rod big ends."

From these statements any operator of truck or bus fleets can quickly figure what his own savings in maintenance and operating costs would be if all his engines had TOCCO-hardened shafts.

INSIST ON THE LONG-WEARING TOCCO-HARDENED CRANKSHAFTS

THE OHIO CRANKSHAFT CO. *Cleveland, Ohio*

and alternators, rather than one excessively large unit.

For current requirements up to perhaps 1,000 kva., and especially for industrial use or for the lighting of individual buildings, the generation of single phase current is customary.

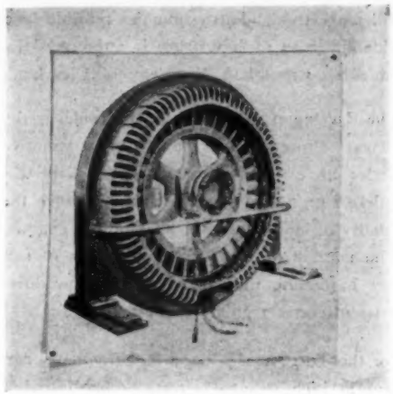


Fig. 6. G.E. 32 pole, three-phase generator.

A single phase alternator is shown in Fig. 5. For large installations, supplying towns and municipalities with electricity for home and industrial uses, three-phase generators are usually employed, distinguishable by the three connections leading to the armature, any two of which furnish single phase current. A large 32 pole G.E. alternator is shown in Fig. 6.

From the chart, Fig. 3, we find that a 32 pole alternator must be driven at 225 rpm. in order to generate current at a frequency of 60 cycles. But for the generating of 25 cycle current, a 32 pole alternator may be driven at but 93¾ rpm. as per chart, Fig. 4.

In some instances – but infrequently – two-phase alternators are made use of. Here one finds four leads coming from the armature, two leads for each phase. The return leads are sometimes connected together at the armature,

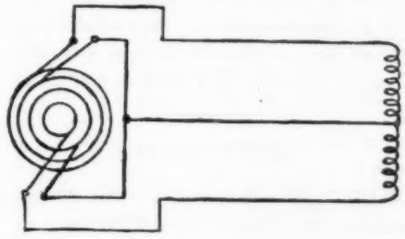


Fig. 7. Common-return, two-phase alternator.

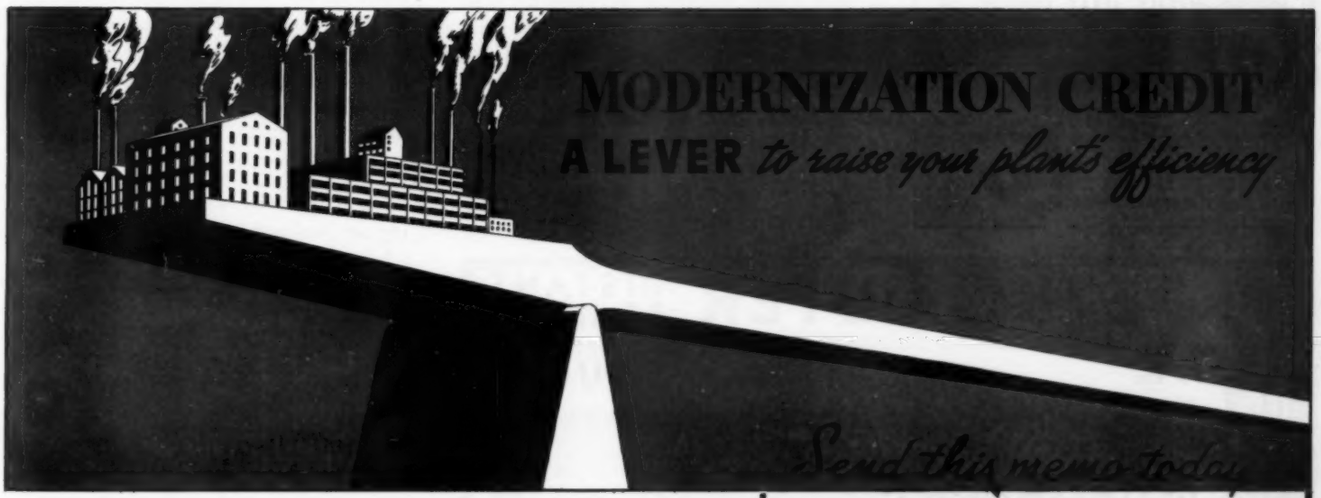
so that but three leads are needed for outside connections. The scheme is shown graphically in Fig. 7.

The three-wire connections of two-phase alternators sometimes puzzle the uninitiated, since to all outward appearances three wires indicate a three-phase alternator. The explanation given here, as well as the schematic diagram, Fig. 7, should clear up the apparent mystery.

Referring again to charts, Figs. 3 and 4, one may determine at a glance:

1. For a Diesel engine of a given number of rpm. the number of poles of the alternator necessary for the generating of current at the standard frequencies of 60 and 25 cycles.
2. For alternators of a given number of poles and frequencies of 60 and 25 cycles, the required rpm. of the driving Diesel engine.

Thus if the reader encounters in practice such seemingly uncalled for rpm. as 187.5, 112.5, 93.75 or perhaps 83.33 he will understand that such speeds are not indicative of eccentricities on the part of the Diesel or electrical engineer, but are necessitated by the fundamental principles involved.



Would a battery of new type machines speed up your production? Or a new power unit for your plant effect year around savings?

No matter what type, or how large the amount of new machinery and plant equipment you need, it may now be purchased on the E. A. C. Modernization Credit Plan.

Your payments are spread over a period up to 36 months, giving the equipment an opportunity to help pay its own way.

The charge for E. A. C. Credit is the lowest generally available for similar financing and is usually less than the present cost of floating small capital issues. It is also free from the red-tape, burdensome detail and supervision of your business, often associated with other current forms of financing.

So ask your supplier about this E. A. C. Modernization Credit Plan. Or, if you prefer, we are glad to have you write us.

CHECK THIS LIST! Types of machinery and equipment listed, which if purchased on credit, may easily pay for themselves out of earnings or savings include:

Diesel engines, air compressors, cranes, drilling equipment, grinders, generator sets, hoists, injection pumps, oil field line pumps, refrigerators, water pumps, etc.

EQUIPMENT ACCEPTANCE CORPORATION
A UNIT of COMMERCIAL INVESTMENT TRUST CORPORATION
1 Park Avenue, New York City
CAPITAL AND SURPLUS OVER $100,000,000

Without obligating myself in any way, I am interested in considering taking advantage of your Modernization Credit Plan to purchase such equipment as:

DESCRIPTION AND MAKE OF EQUIPMENT	ESTIMATED COST

FIRM NAME _____

ADDRESS _____

REPLY TO _____ D-5

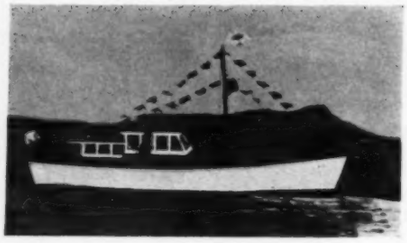
DIESEL
MECHANICS and TECHNICIANS
The most exclusive Diesel Training School on Atlantic Coast. Combination Home Study, including six weeks' practical shop work.
Information and Circular on request.
NEW YORK DIESEL INSTITUTION
47-51 RECTOR ST., NEWARK, NEW JERSEY
738 Broadway (Home Office) Albany, N. Y.

ANY AND ALL TYPES and makes of instruments used in connection with Diesel Engines repaired in astonishingly short time, reasonably. All work fully guaranteed. New Diesel Engine thermometers furnished.
INSTRUMENT SERVICE COMPANY, INC.
310 Twelfth Street Hoboken, N. J.

WRITE for complete engineering and performance data on American Air Filters for Diesel Engines and Compressors.
AMERICAN AIR FILTER COMPANY, INC
INCORPORATED
80 CENTRAL AVENUE — LOUISVILLE, KENTUCKY

Now You Can Obtain High Carbon Steel Cylinder Liners
We can spray high carbon steel liners into your cylinders so that all the wear will fall on the rings which, of course, are much more easily and economically replaced. Similarly, crankshafts, oil pump plungers, piston rods, wrist pins, and other wearing parts can be built up, avoiding expensive replacements. . . . *Literature on request.*
MOLTEN METALS SPRAY DIVISION OF CONDENSER SERVICE & ENG. CO., INC.
310 Twelfth Street Hoboken, N. J.

HEAT EXCHANGERS for jacket water, intercoolers, etc., designed and built to suit your requirements. Replacement bundles and other parts for any and all makes furnished. Fast service, right prices.
CONDENSER SERVICE & ENG. CO., INC.
310 Twelfth Street Hoboken, N. J.



DIESEL SAMPAN

MR. H. D. SLOGGETT of Honolulu, T. H., calls his Diesel modified sampan the A'U which, in Hawaiian, means Swordfish. This sturdy vessel, designed by G. N. Rothwell, is 50 feet long with a beam of 13 feet 6 inches and 17 tons displacement. Power is furnished by a pair of Buda Diesel engines. Her rudders are also in duplicate. Seven hundred gallons of fuel oil gives Mr. Sloggett a cruising range of 1,200 miles at a speed of nine knots.

BERYLLIUM

THE Beryllium Corporation of Pennsylvania presents the recently released bulletin entitled "Announcing Beryllium Copper Heat Treated Castings." In substance this deals with the vastly improved properties of copper to which a small amount of Beryllium has been added. In heat treatment especially this metal acquires new characteristics far beyond any known copper base alloy. Briefly, this ordinarily ductile metal assumes an amazing tensile strength and hardness after heat treatment. The important step from wrought Beryllium Copper to castings of the same combination should be of interest to the Diesel industry.

NEW PROCESS SPEEDS HARDENING OF METAL SURFACES

DEVELOPMENT of a revolutionary new process for the hardening of metal surfaces by means of electrical induction, which definitely will make tremendous economies possible in a wide diversity of industries, is announced by the Ohio Crankshaft Company of Cleveland.

The development, known to the trade as the "Tocco Process," was hailed in automotive circles as a great forward step which will quicken production methods and improve the quality of crankshafts for all kinds of engines. The method not only reduces "hours of surface hardening time to seconds but produces a scientifically regulated, exact result."

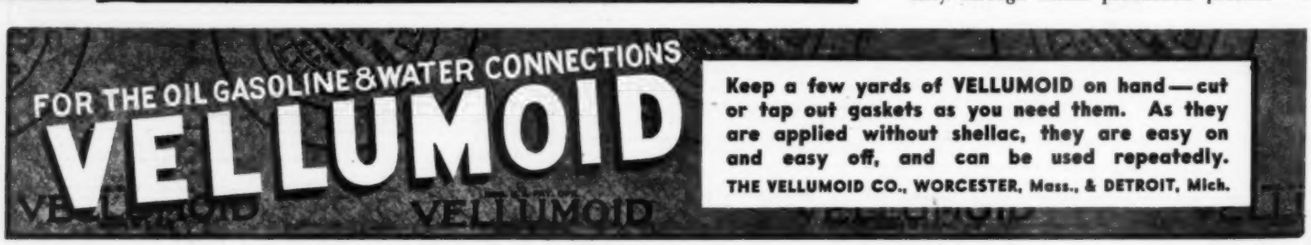
For the Tocco-hardening, a high-frequency current at high voltage is transformed into low voltage with high amperage. This current passes into inductor blocks which surround but do not actually touch the bearing area it is desired to harden. The inductor block current induces a current in the surface of the metal. This induced current is the heating factor.

When the area to be heated has been thus subjected to an accurately controlled, high-frequency current for the correct length of time, the electrical circuit is opened and simultaneously the heated surface is quenched by a spray from a water jacket built into the inductor block.

When all the main, intermediate and pin bearings are hardened the entire shaft is drawn at a low temperature to remove strains. Then a final grind completes the shaft.

The combination of instantaneous pressure quenching and a split-second heating cycle produces a surface hardened zone, blending gradually into the core with no sharp line of demarcation and consequently no opportunity for spalling.

The Tocco process of selective surface-hardening by electrical induction has been found through years of experimental work — and latterly through actual production practice — to


FOR THE OIL GASOLINE & WATER CONNECTIONS
VELLUMOID
Keep a few yards of VELLUMOID on hand — cut or tap out gaskets as you need them. As they are applied without shellac, they are easy on and easy off, and can be used repeatedly.
THE VELLUMOID CO., WORCESTER, Mass., & DETROIT, Mich.

answer every requirement of the metallurgist and the engineer. Electricity can be accurately controlled. The Tocco process permits the surface heating and quenching of practically all ferrous materials of cylindrical section, with the resulting hardened surface kept within close limits as to area and depth.

The first application of the Tocco process to be worked out and perfected for industrial use has been the hardening of crankshafts at the bearing surfaces. The proper hardening of crankshafts has always presented a serious problem to the manufacturers of internal combustion engines. As engines have been speeded up to increase horsepower without increasing size, harder bearing metals have been necessary. These harder bearing metals have produced more wear on the crankshaft bearings, which in turn has meant increased maintenance, more frequent overhauling, particularly on heavy-duty engines, and excessive oil consumption.

In adopting the Tocco process of surface hardening the manufacturers of engines not only in many cases effect a pronounced saving in the cost of manufacture by eliminating costly alloy steels and cutting down machining time, but also are assured of a superior hardened area — a longer-lived shaft. While these savings to the manufacturer are important and have been welcomed by many of the largest engine builders in the United States, still more important savings are assured their customers. Operators of buses, trucks and all heavy-duty machinery equipped with engines with Tocco-hardened chankshafts are reporting important economies — less frequent and less costly overhauls, lower oil consumption, far longer periods of uninterrupted service. Recently passenger car manufacturers have adopted the Tocco process to obtain the same obvious benefits and advantages.

The Tocco process has already been adopted by such outstanding manufacturers as the International Harvester Company, the General Motors Corporation, Hercules Motors Corporation, the Packard Motor Car Company, the Waukesha Motor Company and many others.

The heat of steel to be used on a crankshaft which is to be Tocco-hardened must be one which passes the usual inspection tests and in addition should be of the fine-grained type. After forging, the crankshaft is allowed to cool slowly, this alone producing the necessary normalizing. Then without further normalizing or heat treating, it is machined, radial oil holes drilled and the journals rough-ground. The final grinding operation follows the surface hardening.

HERE IS THE ANSWER
To Your VIBRATION Problem!

Don't guess about it— KNOW!

Write for FREE COPY NOW!

—20 PAGES—

Explains clearly the theory of *VIBRATION CONTROL* and gives practical applications, engineering data and actual installations of KORFUND—ANTI VIBRATION PRODUCTS.

See our exhibit at the Power Show—Booth No. 32.

The KORFUND COMPANY, Inc.
48-26 32nd PLACE :: :: Long Island City, N. Y.

"What is Sauce for the Goose is Sauce for the Gander"

THERE HAS BEEN NO SPARKING
FOR TURECAMO GIRLS
FOR OVER TWO YEARS
AND THERE'S TO BE NO SPARKING
FOR TURECAMO BOYS EITHER
BOTH ARE EQUIPPED WITH
MODEL SC-2 MAXIM SPARK ARRESTOR SILENCERS

NOTE: The Model SC-2 meets the new regulations of the U. S. Steamboat Inspection Service effective November 15, 1938.

THE MAXIM SILENCER COMPANY
HARTFORD CONNECTICUT
Sales Department 50 Church St., New York City

from a Diesel engine manufacturer . . . . .
* ONE OF AMERICA'S LARGEST *

"Properly trained Diesel men are a valuable asset to the future of the Diesel industry . . . you are doing a great work for both the industry and for men who wish to enter into the fine opportunities thus being created."

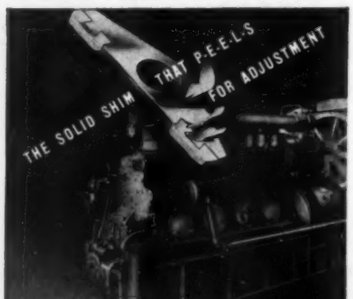
The best evidence that Hemphill Diesel Schools are worthy of such praise from a prominent Diesel engine builder is the large number of Hemphill graduates that are holding responsible positions with both engine builders and users. When you are in need of thoroughly trained Diesel men, write to the manager of our nearest school.

HDS HEMPHILL DIESEL SCHOOLS

Were America's first institution to devote their entire efforts exclusively to the training of men for the Diesel field. Located only at addresses shown below.

BOSTON	**110 Brookline Ave.**
NEW YORK .	**31-28 Queens Blvd., L. I. City**
DETROIT	**2340 W. Lafayette Blvd.**
CHICAGO	**2020 Larrabee St.**
MEMPHIS	**421 Monroe Ave.**
LOS ANGELES . . .	**2121 San Fernando Rd.**
SEATTLE	**503 Westlake North**
VANCOUVER, B. C. . .	**1365 Granville St.**

HEMPHILL TRAINING PAYS



sealing bearing oil pressure

THE SOFT BABBITT TIPS of Laminum Babbitted Shims, pat'd, solve the problem of maintaining bearing oil pressure in forced feed lubricated systems. They seal the oil in the bearing. The laminated brass body of the shim provides the practical economy of precision service adjustments for the life of the bearing! You simply p-e-e-l your precision adjustments . . . one or more laminations at a time. Used in pumps, compressors, Diesels, etc. throughout the world. Either .002 or .003" laminations available.

LAMINUM *Precision adjustment* SHIMS

LAMINATED SHIM CO., LONG ISLAND CITY, NEW YORK

NEW HAVEN DIESELS

. . . *Continued from page 25* . . . .

less of direction of operation. The operator can look across the top of either hood, and see cars or locomotives on the other side, a real advantage in yard work.

The Diesel engine drives the generator through a flexible coupling, the generator being mounted on an extension of the engine sub-base. The generator output varies with Diesel engine speed in the conventional way as on any variable speed engine equipment. However, at full throttle the generator characteristic is of such shape that full engine horsepower is utilized at all speeds from approximately 2 to 15 mph., thus assuring maximum performance of the locomotive within the entire range of switching operation. The excitation is the combined self and separate type, the constant horsepower portion of the curve being controlled by a centrifugally operated vacuum switch, belt driven from a pulley on the end of the generator shaft. This "horsepower governor" holds a constant speed of 750 rpm. on the engine at full throttle by automatically varying the generator excitation to produce full load from 2 to 15 mph. Thus the entire automatic load control for holding constant engine horsepower is housed in a small box on top of the generator — simple, stable and reliable.

The traction motor equipment consists of four GE-724's which are axle hung, nose suspended units with double reduction drive. In these motors, the high speed pinion, mounted on the armature shaft drives a gear on an intermediate shaft which also carries the low speed pinion, the latter meshing with the main gear on the axle. The intermediate shaft is supported in anti-friction bearings in the gear case, which also forms part of the motor frame structure and is of heavy rigid construction.

There are several reasons for going to a double reduction motor on this equipment. For switching service, where the majority of the work is done at speeds of 5 to 8 mph. and maximum speeds rarely exceed 12 to 15 mph., it seemed logical to design a motor whose best efficiency would occur in this low speed range, limiting the maximum speed to about 25 mph. which would take care of transfer work and light movements. The double reduction motor was the answer. Moreover, the armature becomes a high speed unit and hence comparatively small. The net result is that the GE-724 motor complete with gearing and all accessories weighs 4,500 lbs. against 8,100 lbs. for motors used previously in similar applications. The smaller motor permits the use of a standard 33-inch tender wheel resulting in a further economy.

The motors are forced ventilated by fans, belt driven from a pulley on the end of the generator shaft, the air being carried through ducts on the underframe and introduced to the motors through a sliding plate connection. The continuous tractive effort rating of each motor is 7,000 lbs., giving a total rating of 28,000 lbs. at approximately 6 mph.

Traction motors are permanently connected two in series on each truck, and two motor connections are used, series-parallel full field and series-parallel shunted field. It will be noted that there is no transition other than the change from full to reduced field. This means simplified main control connection and snappier performance because there is no lapse in tractive effort during the transition period.

The field shunt circuits serve a double purpose. By the selective operation of the proper field shunting contactors, weight transfer between axles is compensated for during operation at high adhesion. In other words, the field of the motor on the leading axle of each truck is shunted, thereby reducing the tractive effort on that axle approximately in proportion to the amount of weight relieved. This allows all four axles to operate at the same adhesion even though their loads are different, and thereby advantage is taken of the **entire** weight of the locomotive, and not the weight as limited to about four times the load on the lightest axle under severe weight transfer conditions. Weight transfer compensation is obtained by operation of a foot pedal at the engineer's position and is used under much the same conditions as sand. By its use the effective weight of the locomotive is increased about 10 per cent.

As a further aid to rapid switching, slip relays are installed which operate a buzzer at the engineer's position when slipping occurs, giving him instant warning that he has lost the tractive effort on one truck or both. This allows a quick recovery and also keeps the engineer in constant touch with track conditions so he can take whatever measures necessary to avoid slipping.

Summarizing the points that make this locomotive an exceptionally fast and facile switcher:

1. Excellent visibility and convenience of controls.
2. Gentle acceleration when cracking throttle, for couplings.
3. Throttle not sensitive — may be opened rapidly on good rail without slipping wheels.
4. Full engine utilization from 2 to 15 mph.
5. No transition dip in tractive effort.
6. Weight transfer compensation.
7. Wheel slip indicator.
8. Higher efficiency in switching range of speed.

The main generator also furnishes power for all auxiliaries. At idling speed, 300 rpm., with the throttle in the off position, the main generator voltage is regulated at 115 volts by a voltage control relay. Under these conditions, the generator furnishes light and control power, charges the 48 cell battery, drives the compressor at full displacement, and operates the radiator blower at reduced speed. The traction motor blowers are belt driven from an extension of the main generator shaft.

When the throttle is open, the generator continues to operate the compressor and radiator blower, but the battery charge is dropped and the battery furnishes power for control and lights.

The compressor is a high speed, single stage, water cooled machine with a displacement of 100 cu ft per minute. It is driven by a double commutator motor, for operation at full displacement at 115 volts during idling, and the other driving at full displacement at 600 volts for operation when the generator is furnishing traction power. Increased speed and water cooling have made possible a drastic reduction in size of this machine as compared to a two stage slow speed, air cooled unit. Moreover, the construction of the compressor itself has been greatly simplified by the use of eccentric drive on two opposed pistons, eliminating gearing and crankshaft and giving practically vibrationless operation.

The cooling of the water and lubricating oil is accomplished by circulation through the radiators mounted forward on the operating cab. The three sided radiator construction exposes a large surface to the outside air, and the fan is so arranged that almost uniform velocity is maintained through the whole air path. This gives the required cooling with a relatively low fan horsepower. The aphonic type fan is extremely quiet and highly efficient. Operation of the fan is controlled automatically by a thermostat, relieving the engineer of this duty, providing minimum fan operation and best temperature conditions for the engine. In order to provide the radiator with greater flexibility for seasonal temperature changes, semi-permanent winter covers are supplied for the front portion, and adjustable shutters for the side portions, in one of which the oil sections are mounted.

The radiator is composed of individual sections bolted to headers, permitting the replacement of any one section without disturbing any other. The lower header is the floating type resting on supporting springs which provide a flexible mounting relieving expansion strains caused by temperature changes in the radiator.

Copper tubing is used in all water, fuel oil and lubricating oil lines, saving space, preventing corrosion, and making a more accessible piping layout. Except where unions are necessary to remove apparatus, sweat fittings are used, which gives an exceptionally tight piping installation.

Provisions were made for heating the locomotives in cold weather from an external steam supply when the diesel engine is shut down. Keeping the engine from freezing is always a troublesome problem during layovers as either the locomotive must be placed in a warm building, or the cooling system must be drained, or an anti-freeze solution used. Even if actual damage is prevented by either of the latter two means, the temperature of the engine and the lubricating oil may go down low enough to make starting a serious problem.

The New Haven diesel electric switchers, therefore, were equipped with a 2 in. insulated steam line with standard hose and coupler head at each end. They can be connected either to yard steam supply or to a steam locomotive, and the engine jacket, radiator, piping, etc., kept warm.

From this 2 in. steam line, two connections are taken off; one leads to the 4 in. water pump suction line and the other to the 4 in. engine discharge water line to the radiators. Each connection leaving the main steam line has a strainer, globe valve and check valve, with a nozzle in the water line.

The generator is isolated from the engine compartment by a partition, the generator fan discharging on the engine side of this partition. Thus the generator draws cool air in over the control equipment and discharges it into the engine room, putting the engine room under pressure to assist in its ventilation. The air intake of the engine is taken almost directly at the louvers in the hood doors so as to provide the coolest air possible.

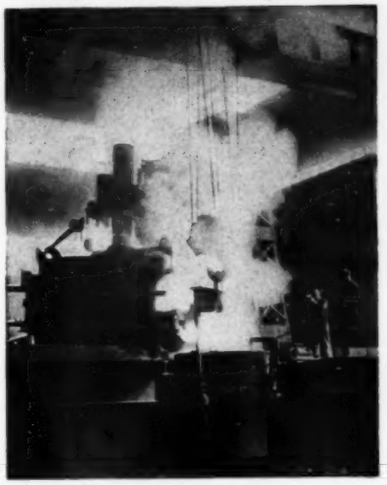
Up to the middle of October three locomotives had been delivered to the railroad and immediately prepared for and put into regular 24 hour a day service in New Haven.

Preliminary plans call for the assignment of three locomotives in New Haven, two in Providence, and five in Boston. All locomotives are shipped to New Haven and are put in service there first, being moved on to Providence and Boston as additional locomotives are received.

As a precautionary measure, each locomotive was given from three to five days in actual switching service in and around the builder's works prior to shipment. The purpose of this was to develop such faults as were likely to occur in new equipment and correct them before delivery. That it has been possible to put the locomotives already delivered into continuous revenue service immediately has undoubtedly been due in no small measure to this policy.

National Forge and Ordnance Company

Irvine, Warren County, Penna.



All National Forge and Ordnance Company products are manufactured from fine quality Basic Electric Steel.

Complete control of all processing from selection of the melting charge to the finished condition is National Forge and Ordnance Company's guarantee for maintenance of quality in crankshafts and various other types of forgings furnished to leading manufacturers in the Diesel industry.

BASIC ELECTRIC STEEL FORGINGS

Carbon, Alloy, Corrosion Resistant and Special Steels Smooth Forged, Hollow Bored, Rough or Finished Machined, Heat Treated to Specifications. . . Forging Quality Ingots Pressed or Hammered Billets.

WAUKESHA-RICARDO
Diesel Engines
•
WAUKESHA-HESSELMAN
Oil Engines

Design, Development and Testing of Diesels and Auxiliaries. Consulting Service for potential Diesel users.

UNITED STATES DIESEL CORP.
89-91 BRIGHTON AVE., BOSTON, MASS.

VORTEX SPARK ARRESTER SILENCERS
ENGINEERING SPECIALTIES CO., Inc.
39 CORTLANDT ST., NEW YORK CITY

DIESEL PROGRESS

INDEX OF ADVERTISERS

	PAGE
American Air Filter Co.	56
American Bearing Corp.	60
American Hammered Piston Ring Co.	7
Buda Company, The	6
Burgess Battery Co.	51
Condenser Service and Engineering Co.	56
Cooper-Bessemer Corporation	Back Cover
Diamond Chain and Manufacturing Co.	48
Elliott Company, The	Third Cover
Ellwood City Forge Co., The	8
Engineering Specialties Co.	59
Erie Forge Company	4
Equipment Acceptance Corp.	55
Fairbanks-Morse & Company	10
Fluid Meters, Inc.	59
Goulds Pumps, Inc.	9
Gulf Refining Company	Second Cover
Hemphill Diesel Schools	58
Hercules Motor Company	20
Illinois Testing Laboratories	59
Ingersoll-Rand Company	12
International Harvester Co.	17
Korfund Company, The	57
Laminated Shim Co., The	58
Maxim Silencer Co., The	57
Motor Improvements, Inc.	11
National Forge & Ordnance Co.	59
National Superior Co.	15
New York Diesel Institution	56
Nordberg Mfg. Co.	1
Norma-Hoffmann Bearing Corp.	14
Wm. W. Nugent & Company, Inc.	47
Ohio Crankshaft Co.	Insert between 54 & 55
Petrometer Corp.	56
Quincy Compressor Co.	54
Ross Heater & Mfg. Co.	46
Schoeck Diesel School	59
Sharples Specialties Co.	59
Snap-On Tools, Inc.	52
Socony-Vacuum Oil Company	2-3
Standard Oil Co. (Indiana)	13
Texas Company, The	18
United States Diesel Corp.	59
Vellumoid Company, The	56
Waukesha Motor Company	59
Westinghouse Electric & Mfg. Co.	5
Winton Engine Corp.	30-31
Worthington Pump & Machinery Corp.	16
Young Radiator Company	59

NOW—a *Positive Displacement Fuel Meter*

Rugged construction. Accurate measurement. Capacity $\frac{1}{10}$ to 14 gallons per hour at 8" head. Corrosion resistant. A positive, constant check on Diesel fuel economy and delivery.

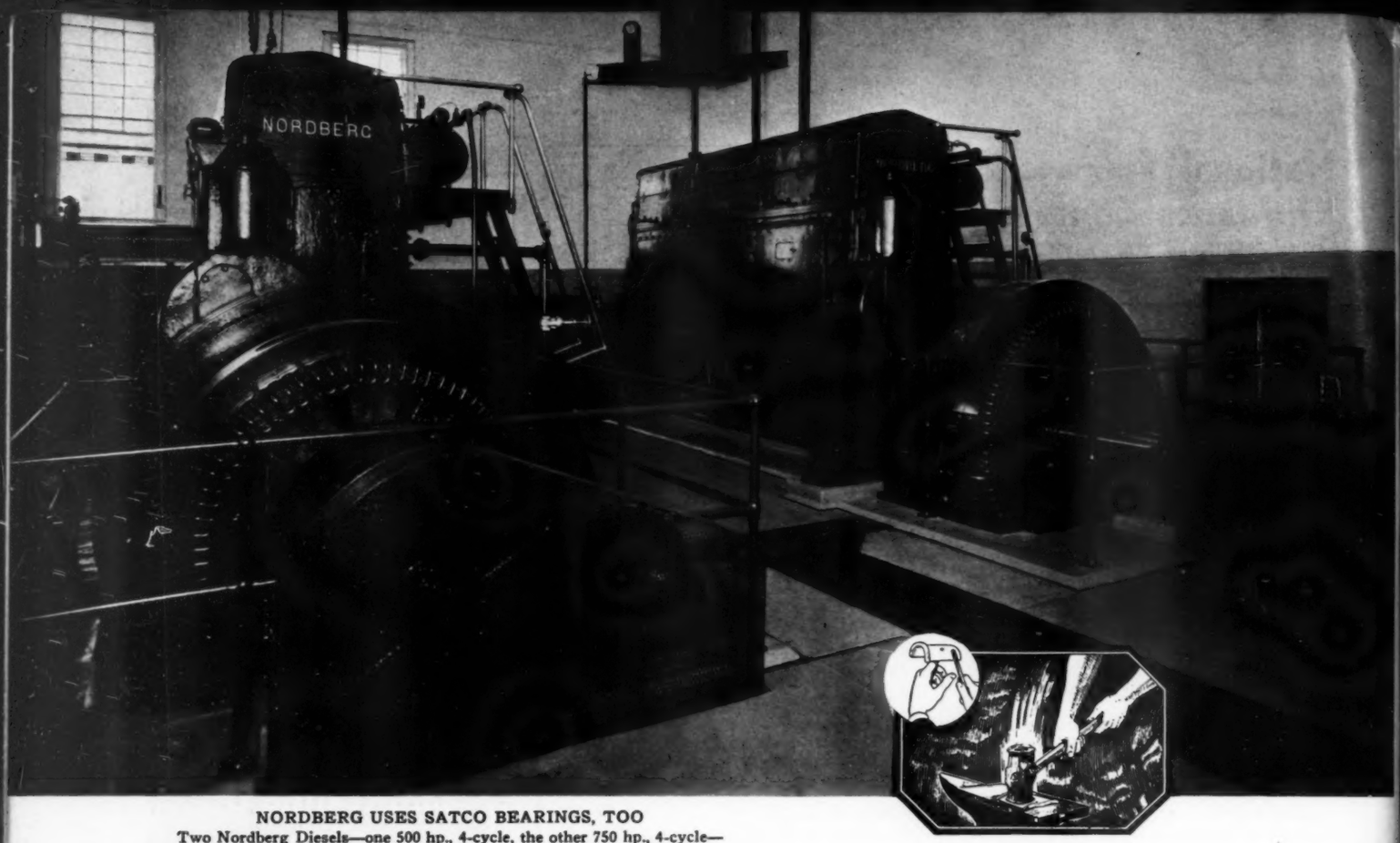
FLUID METERS, Inc.
Chrysler Bldg., N. Y. C.

SHARPLES
Centrifugal
Diesel Fuel *and* **Lubricating Oil Purifier** *for* **Land** *and* **Marine**
THE SHARPLES SPECIALTY CO.
2304 Westmoreland St., Phila., Pa.

EMPLOYERS • We have Diesel students and graduates everywhere. • Will appreciate an opportunity to help you.
O. F. SCHOECK DIESEL SCHOOL
ALTON, ILLINOIS

YOUNG
HEAT TRANSFER SURFACES FOR COOLING
GASOLINE OR DIESEL ENGINES ON TRUCKS • BUSSES • TRACTORS • RAIL CARS • LOCOMOTIVES • POWER UNITS
C. H. BULL, 115 10th St., San Francisco, Cal.
L. O. STRATTON, 817 17th St., Denver, Colo.
YOUNG RADIATOR COMPANY
RACINE, WISCONSIN

ALNOR EXHAUST PYROMETERS
ILLINOIS TESTING LABORATORIES, INC.
420 N. LASALLE ST. CHICAGO, ILL.



NORDBERG USES SATCO BEARINGS, TOO

Two Nordberg Diesels—one 500 hp., 4-cycle, the other 750 hp., 4-cycle—operating in a cotton oil mill. American Bearing Corporation furnished the Satco-lined bearings.

"ACHILLES HEEL"

A **DIESEL** may represent the last word in engineering perfection but if the bearings don't measure up there's sure to be a postscript . . . in the form of lay-ups or shut-downs due to early bearing failure. Main and crankshaft bearings are the "Achilles heels" of many an otherwise well-designed engine. Leading Diesel makers and users are standardizing on Satco* lined bearings as insurance against the costly interruptions that can be caused by premature bearing failure.

Satco metal was developed to meet the needs of modern power production. Linings made of this alloy have exceptional resistance to crushing stresses, a low frictional coefficient and a relatively high melting and softening point. Proof of these qualities may be had by examining the service records of numerous important Satco-equipped Diesel installations around the country.

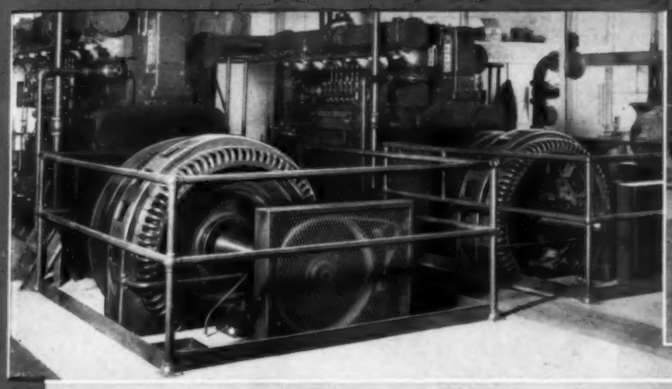
We invite your inquiries on all bearing problems.

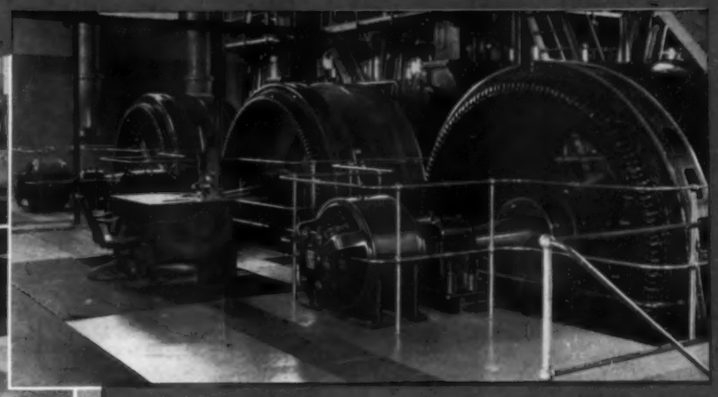
*A patented alloy manufactured by National Lead Company. Trademark registered.

AMERICAN BEARING CORPORATION

AFFILIATED WITH NATIONAL LEAD COMPANY

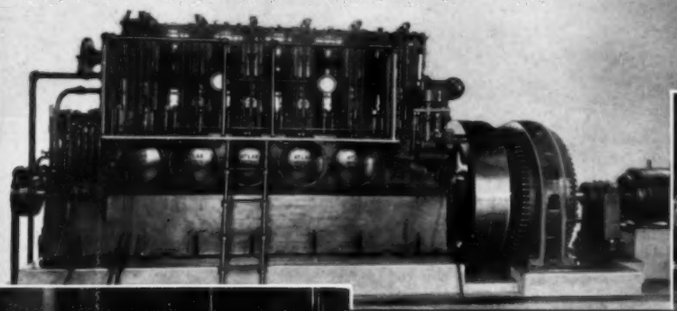
INDIANAPOLIS — CENTRIFUGAL American Bearings FORCE — INDIANA

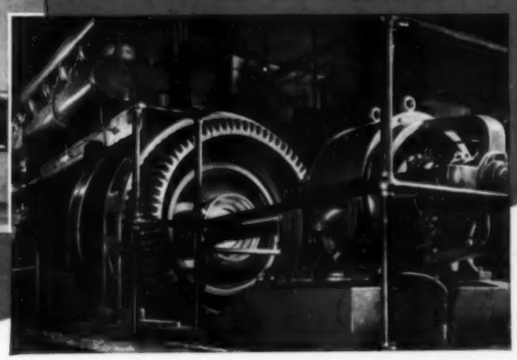




At left above: Two Elliott 300-kw. generators—McIntosh & Seymour engines.

Above: Three Elliott 500-kw. generators—DeLaVergne engines.





At left: Elliott 300-kw. generator—Worthington engine.

Above: Elliott 175-kw. generator — Atlas Imperial engine.

At left: Elliott 500-kw. generator—Nordberg engine.

ELLIOTT GENERATORS

have good records in municipal plants

WHEN a generator is built solidly, is well designed and engineered to the particular Diesel engine it is to serve—as Elliott generators are—good performance is to be expected. And good performance is being delivered by Elliott Diesel engine generators in municipal plants all over the country. The photographs show Elliott generators in several municipal plants driven by five different types of engines.

When it comes to whys and wherefores, we'd like to show you the substantial, heavy, conservative construction, and the correct design in every small detail, which is typical of Elliott Generators.

J-652

ELLIOTT COMPANY

PITTSBURGH, PA.

Electric Power Department

RIDGWAY, PA.

District Offices in Principal Cities

BUILDERS OF ALL TYPES OF GENERATORS FOR DIESEL ENGINES

New Haven *has found the* ANSWER

Cooper-Bessemer Type GN-8 locomotive Diesel rated 650 H. P. at 750 revolutions.

This message is intended for railroad company directors, executives, employees and owners of railroad company shares.

When the time comes for any one of you to suggest how your railroad can meet the country's demand for quicker and cheaper handling of freight, just mention Diesel electric locomotives.

You can be certain of a big saving with any Diesel electric but you can be sure of the greatest saving if the engine is a Cooper-Bessemer Diesel.

Illustrated is one of the five 100-ton switching locomotives recently built for the New York, New Haven & Hartford Railroad. The locomotive is shown in service in the New Haven yards.

THE COOPER-BESSEMER CORPORATION

Mt. Vernon, Ohio — PLANTS — Grove City, Pennsylvania

25 West 43rd Street, New York City
Mills Building, Washington, D. C.
640 East 61st Street, Los Angeles, Calif.
201 East 1st Street, Tulsa, Oklahoma
631 Spring Street, Shreveport, La.
53 Duncan Street, Gloucester, Mass.
Magnolia Building, Dallas, Texas
Esperson Building, Houston, Texas
Gas and Power Equipment Company, Birmingham, Alabama